Group, P.O. Box 368, Wilmington, NC. Send protests to: Sheila Reece, T/A, 800 Briar Creek Rd-Rm CC516, Charlotte, NC 28205.

By the Commission.

Agatha L. Mergenovich,

Secretary.

[FR Doc. 80-1813 Filed 1-18-80; 8:45 am]

BILLING CODE 7035-01-M

[Finance Docket No. 29217]

Atchison, Topeka & Santa Fe Railway Co.—Control—Toledo, Peoria & Western Railroad Co.

Atchison, Topeka and Santa Fe Railway Company (Santa Fe), 80 East Jackson Boulevard, Chicago, IL 60604, represented by Milton E. Nelson, Jr. Assistant General Counsel, The Atchison, Topeka and Santa Fe Railway Company, 80 East Jackson Boulevard, Chicago, IL 60604, hereby give notice that on the 20th day of December, 1979, it filed with the Interstate Commerce Commission at Washington, DC, an application for authority under 49 U.S.C. 11343 for approval of acquisition of stock and control of the Toledo, Peoria and Western Railroad Company (TP&W).

Santa Fe seeks approval of its acquisition of the Pennsylvania Company's one-half interest, 45,000 shares of stock, in the TP&W, currently held in a voting trust with the Illinois National Bank of Springfield pending approval of this acquisition. Since Santa Fe already held 50 percent of the stock in TP&W prior to its agreement with Pennsylvania Company for acquisition of these shares, approval of this application would result in Santa Fe acquiring full control of the TP&W.

Santa Fe seeks approval of the ownership of all stock in the TP&W, and resulting complete control. The TP&W presently operates approximately 300 miles of trackage from Keokuk and Fort Madison, IA, on the west to Logansport, IN, on the east. TP&W is an important originating and terminating carrier in the Peoria and north central Illinois areas, as well as a bridge carrier interchanging traffic with numerous other midwestern and eastern railroads. Under Santa Fe control, TP&W would remain under its own management as a separate operating railroad continuing its own internally generated plans for operation and maintenance, working closely and cooperating with Santa Fe in a number of areas to implement efficiencies in TP&W operations and procedures.

In accordance with the Commission's regulations (49 CFR 1108.8) in Ex Parte No. 55 (Sub-No. 4), *Implementation—National Environmental Policy Act 1969*, 352 I.C.C. 451 (1976), any protests may include a statement indicating the presence or absence of any effect of the requested Commission action on the quality of the human environment. If any such effect is alleged to be present, the statement shall indicate with specific data the exact nature and degree of the anticipated impact. See *Implementation—National Environmental Policy Act, 1969, supra*, at p. 487.

Interested persons may participate formally in a proceeding by submitting written comments regarding the application. Such submissions shall indicate the proceeding designation Finance Docket No. 29217 and the original and two copies thereof shall be filed with the Secretary, Interstate Commerce Commission, Washington, DC 20424, on or before March 6, 1980. Such written comments shall include the following: the person's position, e.g., party protestant or party in support, regarding the proposed transaction; specific reasons why approval would or would not be in the public interest; and a request for oral hearing if one is desired. Additionally, interested persons who do not intend to formally participate in a proceeding but who desire to comment thereon, may file such statements and information as they may desire, subject to the filing and service requirements specified herein. Persons submitting written comments to the Commission shall, at the same time, serve copies of such written comments upon the applicant, the Secretary of Transportation and the Attorney General.

By the Commission, Chairman Gaskins, Vice Chairman Gresham, Commissioners Stafford, Clapp, Trantum, and Alexis. Chairman Gaskins did not participate..

Agatha L. Mergenovich,

Secretary.

[FR Doc. 80-1926 Filed 1-18-80; 8:45 am]

BILLING CODE 7035-01-M

Sunshine Act Meetings

Federal Register
Vol. 45, No. 14
Monday, January 21, 1980

This section of the FEDERAL REGISTER contains notices of meetings published under the "Government in the Sunshine Act" (Pub. L. 94-409) 5 U.S.C. 552b(e)(3).

CONTENTS

1

[M-265; Jan. 16, 1980]

CIVIL AERONAUTICS BOARD.

TIME AND DATE: 10:30 a.m., January 21, 1980.

PLACE: Room 1011, 1825 Connecticut Avenue, N.W., Washington, D.C. 20428.

SUBJECT: International fare increases proposed by Pan American, Braniff and TWA. (BIA)

STATUS: Closed.

PERSON TO CONTACT: Phyllis T. Kaylor, the Secretary (202) 673-5068.

SUPPLEMENTARY INFORMATION: The Board wishes to act as soon as possible so as to allow expedited effectiveness of fare increases deemed acceptable. Staff work on the matter will not be completed before January 17, 1980. Accordingly, the following Members have voted that agency business requires that the Board meet on this item on less than seven days' notice and that no earlier annoucement of this meeting was possible:

Chairman, Marvin S. Cohen
Member, Richard J. O'Melia
Member, Elizabeth E. Bailey
Member, Gloria Schaffer

Public disclosure, particularly to foreign governments of opinions, evaluations, and strategies discussed could seriously compromise the ability of the United States Government to achieve understanding in future rate negotiations which would be in the best interests of the United States. Accordingly, we believe that public observation of this meeting would involve matters the premature disclosure of which would be likely to significantly frustrate future action within the meaning of the exemption provided under 5 U.S.C. 552b(c)(9) and 14 CFR section 310b.5(9)(B) and that any meeting on this item should be closed:

Chairman, Marvin S. Cohen
Member, Richard J. O'Melia
Member, Elizabeth E. Bailey
Member, Gloria Schaffer

Persons Expected To Attend

Board Members.—Chairman, Marvin S. Cohen; Member, Richard J. O'Melia; Member, Elizabeth E. Bailey; and Member Gloria Schaffer.
Assistants to Board Members.—Mr. David Kirstein, Mr. James L. Deegan, Mr. Daniel M. Kasper, and Mr. Stephen H. Lachter.
Managing Director.—Mr. Cressworth Lander.
Executive Assistant to the Managing Director.—Mr. John R. Hancock.
Bureau of International Aviation.—Mr. Sanford Rederner, Mr. Douglas V. Leister, Mr. Ivars V. Mellups, Mr. Herbert P. Aswall, Mr. Vance Fort, Mr. James S. Horneman, Mr. John H. Kiser, Ms. Carolyn K. Coldren, Mr. Francis S. Murphy, and Mr. Joseph Di Bella, Jr.
Office of the General Counsel.—Mary McInnis Schuman, Mr. Peter B. Schwarzkopf, and Mr. Michael Schopf.
Bureau of Domestic Aviation.—Mr. Mark S. Kahan, Mr. Albert Halprin, Mr. Robert I. Stein, and Mr. Julien R. Schrenk.
Office of Economic Analysis.—Mr. Robert H. Frank and Mr. Robert Preece.
Bureau of Consumer Protection.—Mr. Reuben B. Robertson and Mr. John T. Golden.
Office of the Secretary.—Mrs. Phyllis T. Kaylor and Ms. Deborah A. Lee.

General Counsel Certification

I certify that this meeting may be closed to the public under 5 U.S.C. 552b(c)(9) and 14 CFR section 310b.5(9)(B) and that the meeting may be closed to public observation.

Mary McInnis Schuman,
General Counsel.

[S-112-80 Filed 1-17-80; 3:02 pm]
BILLING CODE 6320-01-M

2

COUNCIL ON ENVIRONMENTAL QUALITY.

TIME AND DATE: 11:30 a.m., Thursday, January 24, 1980.

PLACE: Conference Room, 722 Jackson Place, N.W., Washington, D.C. 20006.

STATUS: Open Meeting.

MATTERS TO BE CONSIDERED:

1. Old Business.
2. Briefing on status of agencies' NEPA procedures.
3. Briefing on status of the interagency task force study on Davis Power project.

CONTACT PERSON FOR MORE INFORMATION: John F. Shea III, (202) 395-4616.

January 15, 1980.

[S-109-80 Filed 1-16-80; 4:51 pm]
BILLING CODE 3125-01-M

3

FEDERAL ENERGY REGULATORY COMMISSION.

TIME AND DATE: 2:00 p.m., January 17, 1980.

PLACE: 825 North Capitol Street, N.E., Washington, D.C. 20426, Room 9306.

STATUS: Open.

MATTERS TO BE CONSIDERED: The commission will meet in public session to be briefed by the Staff on proposed amendments to filing requirements in 18 CFR 35.13 (Package A—Docket No. RM79-64). There will be no proposals submitted to the Commission for action at this meeting.

CONTACT PERSON FOR MORE INFORMATION: Kenneth F. Plumb, Secretary, telephone (202) 357-8400.

January 16, 1980.

[S-108-80 Filed 1-16-80; 4:35 pm]
BILLING CODE 6450-01-M

4

[USITC SE-80-6]

INTERNATIONAL TRADE COMMISSION.

AGENCY:

TIME AND DATE: 10:00 a.m., Thursday, January 31, 1980.

PLACE: Room 117, 701 E Street, N.W., Washington, D.C. 20436.

STATUS: Open to the public.

MATTERS TO BE CONSIDERED:

1. Agenda.
2. Minutes.
3. Ratifications.
4. Petitions and complaints (if necessary).
5. Awards ceremonies.
6. Rulemaking on steel wire rope (Docket No. 583).
7. Post-Employment Conflict of Interest Regulstions.
8. Any items left over from previous agenda.

CONTACT PERSON FOR MORE INFORMATION: Kenneth R. Mason, Secretary (202) 523-0616.

[S-113-80 Filed 1-17-80; 3:10 p.m.]
BILLING CODE 7020-02-M

5

METRIC BOARD.

TIME AND DATE: 2 p.m., February 14, 1980; 8:30 a.m., February 15, 1980.

PLACE: The meeting on February 14 and 15 will be held in the Kino Room of the Del Webb's Townehouse, 100 West Clarendon Avenue, Phoenix, Arizona 85013.

STATUS: Open to the public.

MATTERS TO BE CONSIDERED:

February 14

Approval of agenda.
Review/Approval of Minutes—December, 1979 meeting.
State presentation of Issues. A panel of 3 State officials will bring the state views of metric coordinating activity and relationships directly to the Board.
United States Metric Board Administrative Regulations. This regulation describes the organization and functions of the agency.

February 15

Summary and analysis of Board Research Activity. A report by the Research Coordinating Committee that serves to inform the Board on the current activities in the Board's research program.
ICMP Policy and Relationship between the ICMP and the USMB. A discussion of policy matters that bear on the relationship between the Metric Board and the Interagency Committee for Metric Policy.
Resolution on SI usage. A request for approval of a resolution by the Standards Liaison Committee to encourage consistent usage of the SI system in the United States.
Reports. Each committee chairperson and senior staff will give a status report of activities within their jurisdiction.
Agenda items for future Board meetings.

SUPPLEMENTARY INFORMATION: Notice of a public forum to be held by the U.S. Metric Board on February 14, 1980 which will provide individuals and groups the opportunity to comment on metric conversion appears elsewhere in this issue.

CONTACT PERSON FOR MORE INFORMATION: Joan Phillips, 703–235–1933.

Louis Polk,

Chairman, United States Metric Board.

[S–102–80 filed 1–16–80; 3:01 pm]

BILLING CODE 6820–94–M

6

NATIONAL CREDIT UNION ADMINISTRATION.

TIME AND DATE: 9:30 a.m., January 24, 1980.

PLACE: 1776 G Street NW., Washington, D.C., Seventh floor, board room.

STATUS: Open.

MATTERS TO BE CONSIDERED:

1. Review of Central Liquidity Facility Lending Rates.
2. Central Liquidity Facility issues, including: special share accounts; definition of risk assets; definition of gross income; liquid assets for on-call subscription.
3. Applications for charters, amendments to charters, bylaw amendments, mergers, conversions and insurance as may be pending at that time.

RECESS: 10:15 a.m.

TIME AND DATE: 10:30 January 24, 1980.

PLACE: 1776 G Street NW., Washington, D.C., Seventh floor, board room.

STATUS: Closed.

MATTERS TO BE CONSIDERED:

1. Requests from federally insured credit unions for special assistance under Section 208 of the Federal Credit Union Act in order to prevent their closing. Closed pursuant to exemption (8) and (9)(A)(ii).
2. Administrative Actions under Section 120 of the Federal Credit Union Act. Closed pursuant to exemptions (8), (9)(A)(ii), and (10).
3. Consideration of merger applications. Closed pursuant to exemptions (8), (9)(A)(ii), and (10).
4. State chartered credit union insurance applications. Closed pursuant to exemption (9)(A)(ii).
5. Monthly review of the 1980 Budget. Closed pursuant to exemption (9)(B).
6. Personnel Actions. Closed pursuant to exemptions (2) and (6).

CONTACT PERSON FOR MORE INFORMATION:
Rosemary Brady, Secretary of the Board, telephone (202) 357–1100.

[S–110–80 Filed 1–17–80; 11:41 am]

BILLING CODE 7535–01–M

7

NUCLEAR REGULATORY COMMISSION.

TIME AND DATE: January 22, 1980.

PLACE: Commissioners conference room, 1717 H Street N.W., Washington, DC.

STATUS: Open/closed.

MATTERS TO BE CONSIDERED:

Tuesday, January 22

9:30 a.m.

1. Affirmation Session (approximately 10 minutes, public meeting) (items are tentative).
a. Export of Minor Quantities of Nuclear Material.
b. Boston Edison Petition.
c. Revision to Part 20.
d. Immediate Reporting of Significant Events at Operating Reactors.
e. Sheffield.
f. Fialka FOIA.
g. Appointment of Part-Time ASLBP Member.
h. Appointment of Part-Time ASLBP Member.

2. Discussion of Management-Organization & Internal Personnel Matters (approximately 2 hours, closed—Ex. 2 & 6).

1:30 p.m.

Discussion of Philippines Export License Applications (approximately 2 hours, public meeting).

ADDITIONAL INFORMATION: By vote of 4–0 (Commissioner Gilinsky not present) on January 15, the Commission determined pursuant to 5 U.S.C. 552b(e) (1) and § 9.107(a) of the Commission's rules that Commission business required that the affirmation of ALAB–559, held that day, be held on less than one week's notice to the public.

CONTACT PERSON FOR MORE INFORMATION:
Walter Magee (202) 634–1410.

Roger M. Tweed,

Office of the Secretary.

January 15, 1980.

[S–111–80 Filed 1–17–80; 2:09 pm]

BILLING CODE 7590–01–M

federal register

Monday
January 21, 1980

Part II

Environmental Protection Agency

Gaseous Emission Regulations for 1984 and Later Model Year Heavy-Duty Engines

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 86

[FRL 1377-2]

Control of Air Pollution From New Motor Vehicles and Motor Vehicle Engines; Gaseous Emission Regulations for 1984 and Later Model Year Heavy-Duty Engines

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This rule sets forth new regulations for the control of hydrocarbon (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x) emissions from heavy-duty gasoline-fueled and diesel engines. Certification and testing procedures have been revised, and new more stringent emission standards for hydrocarbons and carbon monoxide are prescribed. These regulations are a response to the mandate of the Clean Air Act Amendments of 1977 that HC and CO be reduced by 90 percent from unregulated (1969) gasoline engine emission levels.

The continuing failure of a number of air quality control regions to meet the ambient air quality standards prompted Congress to legislate control of several sources of urban air pollution, among them heavy-duty engines. Contributing a significant percentage of total HC, CO, and NO_x emissions, heavy-duty engines provide an effective route to the control of urban emissions. We estimate that the implementation of these regulations will reduce the lifelong HC emissions from the average heavy-duty gasoline-fueled engine by one ton and CO emissions by 29 tons. Similarly, the average heavy-duty diesel engine will experience a reduction of 0.8 tons in HC. These gains translate into average urban mobile source HC and CO reductions of 17 percent and 30 percent, respectively, by the late 1990's. As a result, the average urban ambient air quality will improve some 2 percent in ozone and 7 percent in carbon monoxide.

EFFECTIVE DATE: January 1, 1984.

ADDRESSES: Material relevant to this final rule are contained in Public Docket No. OMSAPC-78-4 at the U.S. Environmental Protection Agency, Central Docket Section, Waterside Mall, Room 2903B (EPA Library), 401 M Street, S.W., Washington, D.C. 20460, (202) 755-0308. Single copies of both EPA's regulatory analysis containing environmental and economic analysis and the Summary and Analysis of Comments document can be obtained (free of charge) by request from the Director, Emission Control Technology Division, 2565 Plymouth Rd., Ann Arbor, MI 48105.

FOR FURTHER INFORMATION CONTACT: Mr. Chester J. France, Standards Development and Support Branch, Emission Control Technology Division, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, Telephone: (313) 668-4338.

SUPPLEMENTARY INFORMATION:

I. Background

In enacting the 1977 amendments to the Clean Air Act (CAA), Congress directed EPA to prescribe regulations for heavy-duty vehicles and engines. The Act states that, for model year 1983 and beyond, the regulations "shall contain standards which require a reduction of at least 90 percent" in hydrocarbon (HC) and carbon monoxide (CO) emissions, as measured against "baseline" emission levels from gasoline-fueled heavy-duty engines. The "baseline model year" was defined as "the model year immediately preceding the model year in which Federal standards" first applied to such a vehicle or engine; in the case of HC and CO emissions from heavy-duty engines, the baseline year is 1969.

EPA responded to this mandate by beginning in late 1977 to design and conduct a program of procurement and emission testing of 1969 engines. Simultaneously, we prepared a Notice of Proposed Rulemaking (NPRM) which appeared in the **Federal Register** on February 13, 1979 (44 FR 9464). The NPRM contained the proposed regulations in their entirety, with the exception that the precise numerical values representing the 90 percent reductions were not finalized. Only estimated emission values could be provided since the baseline testing was not yet complete.

The first of two related public hearings was held in Ann Arbor on May 14-15, 1979, at which time the final baseline numbers and final test report were available. The final numerical values representing the standards were very close to those estimated in the February 13, 1979 NPRM. The record remained open for comment until June 29, 1979. Because the baseline data had not been available for public comment, a second hearing was held July 16-17, 1979, again in Ann Arbor. Testimony and comments were primarily limited in this instance to the baseline testing program and its results and those portions of the February 13, 1979 proposal directly affected by the final standards. Development data and other information relating to alternative test cycles to the transient test cycle were also solicited. The second comment period ended August 17, 1979.

EPA received a large amount of input from interested parties during the two comment periods. The EPA staff has summarized and responded to the comments in a document called "Summary and Analysis of Comments", that is now available through the Central Docket Section, Public Docket No. OMSAPC-78-4 (See **ADDRESSES**, above). In addition, a presentation of those aspects of the NPRM which were changed in response to the comments appears later in this Preamble, under Public Participation.

II. Components of the Package and Major Issues

This rulemaking package is a composite of a number of interrelated components which combine to form a consolidated regulatory approach. In this "comprehensive strategy", EPA is simultaneously establishing many of the requirements that are likely to be necessary for effective control of emissions from heavy-duty engines and vehicles in the near term. Thus, the package is somewhat complex. Yet EPA believes that it is far more efficient and cost effective to put into place initially all the significant requirements affecting heavy-duty vehicles and engines rather than to introduce them in a piecemeal fashion over the next few years. By providing the manufacturers with the entire regulatory scheme well in advance of the model year in which these requirements will take effect, the manufacturers can develop a comprehensive compliance strategy without concern that the rules are going to keep changing—a criticism that has been expressed with regard to regulations governing light-duty vehicles.

A. Emission Standards

The new, more stringent HC and CO standards introduced here are accompanied by a NO_x standard which requires a level of control approximately equal to that required currently (1979). The introduction of the NO_x standard is linked to the changing of the heavy-duty test procedure, as described below under "Test Procedures." The new test procedure will be used not only for HC and CO measurements, but for NO_x as well. Therefore, even though no additional NO_x control is required by

these regulations,[1] it was necessary to derive a NO_x standard based on the transient test that approximates equivalent stringency to that currently in place using the existing steady-state test.

The correlation between the current steady-state test procedure and the new transient procedure is very poor; direct conversion of the present "steady-state" NO_x standard to a "transient" standard is not possible. We were able, however, to observe the NO_x emissions from twelve 1979 heavy-duty gasoline engines and several diesels on the new test procedures. Their mean NO_x level was adjusted upward by two standard deviations as a way of assuring that very few, if any, engines will have difficulty meeting the standard with 1979 NO_x control technology.

The HC and CO standards were derived from a "baseline" test program. Twenty-three 1969 model year gasoline heavy-duty engines, chosen in numbers proportional to their sales fractions in the 1969 market, made up the sample; engines representing 81.5 percent of the sales were tested. Once these uncontrolled emissions had been measured on the transient test procedure, it was a straightforward matter to reduce the HC and CO numbers by 90 percent and arrive at the final standards.

The units of the standards are in the form of grams per brake horsepower-hour (g/BHP-hr). As in the case of the current heavy-duty regulations, emissions are regulated with respect to the amount of work the engine does. This practice has the effect of avoiding the penalizing of a larger, harder-working engine. The transient test emission standards prescribed by these regulations are as follows: HC:1.3 g/BHP-hr, CO:15.5 g/BHP-hr, NO_x:10.7 g/BHP-hr.

In conjunction with the transient standards is established an idle-test standard for gasoline engine CO emissions. A description of the idle test procedure and an explanation for its introduction may be found below in the section headed "Test Procedures". Here we will present the idle standard, which, like the transient standards, is derived from the 1969 baseline engine tests (idle emissions were measured on 19 of the 23 baseline engines). In terms of raw exhaust gas concentrations, the idle standard is 0.47 percent CO.

These regulations also require that diesel crankcase emissions be eliminated from naturally-aspirated heavy-duty diesel engines. Statutory authority for these requirements is found in § 202(a) of the amended CAA. On naturally-aspirated diesel engines, recent EPA analysis [2] shows that closing the crankcase is a cost-effective means of controlling three of the designated "criteria pollutants"—HC, NO_x, and particulates. Turbocharged heavy-duty diesel engines would require more expensive systems in order to protect the turbocharger from the oily and potentially harmful crankcase emissions; hence, the cost effectiveness for this type of engine is not attractive (compared to other available emission control strategies) at this time.

However, EPA anticipates that current research on the presence of nitrosamines in diesel crankcase emissions may require a reassessment of the necessity of controls on turbocharged engines. Nitrosamines are a very strong carcinogen in animals and strongly suspected to be carcinogenic in humans. Staff technical analysis [3] indicates that a control system employing a pump to bypass the turbocharger is feasible and would eliminate the loss of efficiency associated with direct ducting of emissions into the turbocharger inlet. Accordingly, EPA is postponing the finalization of crankcase control requirements for turbocharged heavy-duty diesel engines. The provisions, though, will remain in proposal status pending the completion of the nitrosamine research. Should EPA decide to pursue a final rulemaking on turbocharged engine controls, the record will be reopened and if requested, a public hearing will be held.

Finally, EPA is allowing the diesel engine manufacturers the option of delaying certification on the transient test until 1985. For the 1984 model year, certification can be accomplished either by carrying-over 1983 certification or, for new testing, by using the 13-mode steady-state procedures. If this option is exercised, the manufacturer will be required to demonstrate compliance with the applicable portions of the regulations and the following emission standards: HC:0.5 g/BHP-hr, CO:15.5 g/BHP-hr, NO_x:9.0 g/BHP-hr.

Formulation of these standards was based on the following considerations. Diesel carbon monoxide will be low no matter where the standard is set, so the transient test standard of 15.5 g/BHP-hr is sufficiently stringent. The NO_x fraction of the current steady-state HC-plus-NO_x standard is generally accepted to amount to about 9 g/BHP-hr, which will assure no significant loss of NO_x control. Clearly, it is with HC control that we have the most concern. There are two reasons for the choice of California's 1983 steady-state HC standard of 0.5 g/BHP-hr. First, the manufacturers are already moving toward this goal in their engine development. Second, although we are unable to establish an acceptable correlation between the transient and 13-mode tests, we chose the California standard to minimize the loss of benefits from this one model year's production.

As discussed in more detail under Section III, "Leadtime," the option of delaying utilization of the transient test for one model year is being made available to give the diesel manufacturers the time to investigate the feasibility of modifying their present eddy-current dynamometers for transient control. (The gasoline engine manufacturers are already equipped with electric engine dynamometers, which are readily converted to transient control.) If a diesel manufacturer decides to attempt to convert its eddy-current dynamometers under the option above, it will have sufficient leadtime to establish transient control capability. This is true even if the manufacturer finds that eddy-current dynamometers are not convertible and that electric dynamometers have to be procured.

There is a real possibility that the diesel option discussed above will result in some loss in air quality benefit. This is because the replacement of the 13-mode test by the transient diesel test will be postponed. Offering this option is appropriate because the optional use of the 13-mode is limited to one year (1984); the loss of control, if any, will probably be restricted to HC emissions and providing this option may result in considerable savings to diesel manufacturers if they can convert eddy-current dynamometers to transient control.

B. Test Procedures

Perhaps the most prominent feature of this rulemaking is the new transient test procedure. The culmination of five years' development by EPA (and, in part, by the heavy-duty manufacturing industry), the transient test exercises the engine through a continually changing series of speed/torque conditions as emissions are sampled. The new testing and sampling requirements differ so greatly from those currently in place that the development of an entirely new set of regulations has been necessary. Another change in the nature of the test

[1] NO_x regulations for the 1985 model year will be proposed soon, including a standard representing a 75 percent reduction from 1973 baseline levels.

[2] See Public Participation Section, "Diesel Crankcase Emissions Controls."

[3] See "Summary and Analysis of Comments" document, Diesel Crankcase Emissions Control Issue.

procedure is the addition of an idle test to measure CO emissions separately during idle operation.

While the transient test procedure as outlined below is a completely new procedure, requiring for the most part new test equipment, for diesels it does not represent the final test procedure expected to be used in 1985 model year testing. EPA plans to soon propose and promulgate regulations governing particulate emissions from heavy-duty diesel engines. In fact, the development of these particulate regulations has been delayed until a transient test procedure became available.

These particulate regulations will require some new equipment in addition to that required by the test procedures being promulgated today. A detailed explanation of the test procedure under consideration for particulate emissions can be found in the EPA Technical Report SDSB–79–18, "Draft Recommended Practice for Measurement of Gaseous and Particulate Emissions from Heavy-Duty Diesel Engines Under Transient Conditions." To ensure that no one would purchase equipment that could not be used after promulgation of the particulate regulation, EPA has modified the test procedure being promulgated today to be completely compatible with particulate testing. With this advance notification, all interested parties can begin to purchase transient testing equipment and use all of this equipment when particulate testing is required in the future. The promulgation of particulate regulations will only require the addition of some new equipment and no replacement of newly-purchased equipment.

The heavy-duty test procedure serves as the standard way of measuring emissions for a variety of purposes. Beyond the initial certification of prototype engines, the test procedure is used at each test point during the service accumulation program. Also, when a selective enforcement audit is conducted at a manufacturing facility, the same test will be performed on the sample engines. Production compliance audits to determine the margin by which an engine family has failed to comply with the standards is yet another application of the test procedure. Any in-use enforcement testing or emission factors testing which the Agency might direct at heavy-duty engines would make use of the standard test procedure as well. And finally, the idle-test portion of the test procedure is likely to be adopted for heavy-duty inspection and maintenance programs, and could be used to trigger the 207(b) emission performance warranty at such time as performance warranty regulations are promulgated (Warranty Regulations were proposed on April 20, 1979 (44 FR 23784)).

EPA is convinced that the new transient test procedure will greatly improve the quality of emissions measurements for heavy-duty engines. It would be desirable to test heavy-duty engines in their chassis using a chassis dynamometer test similar to that currently used for light-duty vehicles. However, due to the size and variety of heavy-duty vehicles, such a test procedure could be quite complex and expensive. Hence, EPA has pursued the engine-only test procedures.

The engine alone will be exercised, and in a manner which as nearly as possible matches on-the-road exercise. Currently, modal engine tests are used which subject the engine to a sequence of steady-state (i.e., unchanging) speed and torque combinations which have little relationship to actual patterns of use. The inaccuracies of a steady-state test become even more serious as stricter standards are applied to heavy-duty engines. It has been shown that emission results from catalyst-equipped gasoline engines, for example, are appreciably different when measured on the two procedures, with the steady-state test giving the impression of more efficient emission control. In fact, EPA has demonstrated in its own testing that it is possible to design a catalyst system that appears to reduce engine emissions to negligible levels on the steady-state test and at the same time provide little or no emission reductions on the transient test. Since the modal tests sample only selected operating modes, they are easier to defeat than the transient test; the motivation to design toward clean test results rather than clean real-world operation increases as the standards become stiffer. EPA sees the transient test as a logical remedy to each of these concerns because of its close approximation of in-use emission performance.

Separate transient test procedures exist for gasoline-fueled engines and for diesel engines. Since the required reductions in HC and CO are so large for gaoline engines, we believe the transient test will clearly be necessary to assure that the 90 percent reductions will actually be achieved by the engines on the road. For diesels, the need for a transient test is based primarily on HC control; their CO levels are already near the 90 percent-reduction standards. Nevertheless, the lifetime reduction in HC emissions from the average heavy-duty diesel that will result from using the transient test will be nearly as great as that from the average gasoline engine and therefore use of the transient test for diesel engines is certainly appropriate (see Effect on the Environment). Additionally, transient testing will be required to control heavy-duty diesel particulate emissions. These regulations are currently being prepared by EPA in response to Congressional mandate and are expected to be proposed in mid-1980 applicable for model year 1985. Similarly, regulations are planned which would require NO_x reductions in heavy-duty engines beginning in 1985. The mandated 75 percent reduction will be difficult for the manufacturers of diesels, and the incentive to design around the test procedure will be great. Transient testing will be needed to assure that the reductions mandated by Congress are actually achieved. Early conversion to transient systems will facilitate the manufacturers' development work toward the NO_x regulations.

Unlike the gasoline engine manufacturers, which already have much of the equipment necessary for transient testing, diesel manufacturers may have to completely replace their present equipment. Primarily for this reason EPA is providing the option for the diesel manufacturers to delay certification on the transient procedure until the 1985 model year. If manufacturers do use this option, some 1984 engines may have higher emissions since the steady-state test is easier to pass. But more time would be available to get the transient systems operating and/or to evaluate whether the present "absorption" eddy-current dynamometers can be used for accurate transient control. For the 1985 model year, however, diesels will have to meet the HC, CO, and new NO_x standards on a transient test.

Transient engine tests are performed in the laboratory using a dynamometer, a computer-based controller, and an emissions sampling apparatus. The dynamometer is simply an electric motor which is linked to the drive shaft of the engine (with the transmission removed) to either absorb the engine's energy and apply a load or to drive the engine. ("Absorption" eddy-current dynamometers, which do not have the capability for driving the engine, cannot simulate engine braking, or "motoring." However, one manufacturer has suggested a way of modifying these dynamometers so that they might be used for transient testing. [See Public Participation, Test Procedures.]) By properly controlling the dynamometer, the engine can be subjected to

conditions which simulate the operation of an engine in a vehicle on the road. Thus, engine speed and torque behavior which was actually measured on in-use trucks has been translated into the sequence of computer commands which in turn controls the engine.

It is the transient-control computer that "drives" the dynamometer through the cycle in a repeatable manner. By sensing and recording the behavior of the engine, the computer allows the operator to determine the actual work done during the run (in brake horsepower-hours (BHP-hrs)) and how closely the engine followed the cycle.

The exhaust flow of an engine is ducted through a machine called a constant-volume sampler (CVS), from which a small proportional sample is withdrawn. This method of sampling is dictated by the varying exhaust flow which accompanies transient operation. (Under the current steady-state procedures, the total mass of the emissions can be determined from direct exhaust gas analysis). To compute mass emissions during transient testing, the total volume of sample, diluted in the CVS, must be measured. In diesel testing, the analysis of the sample to determine the pollutant concentrations may be performed in the following ways. To avoid the condensation of the heavy hydrocarbons, HC is measured by conducting a separate sample in a heated line to the analyzer where it is measured continuously. For NO_x emissions, two sampling options exist. The method proposed in the NPRM is the collection of the sample in a plastic bag for analysis. If this option is chosen, CO and CO_2 are sampled in the same manner. However, it appears that continuous dilute analysis of a heated sample may result in more accurate NO_x measurement as well. As EPA investigates this method (with an eye to possibly requiring it in the 1985 NO_x regulations), we are offering the option of pursuing such a continuous dilute NO_x measurement approach. In this case, CO and CO_2 may be sampled using either method. In gasoline testing, on the other hand, continuous sampling yields little additional accuracy; the regulations specify bag analysis of all pollutants.

Hydrocarbon emissions are measured using a flame ionization detector (FID); CO and CO_2 using a non-dispersive infrared analyzer; and NO_x using a chemiluminescence analyzer. The resulting pollutant concentrations found in the sample are applied to the total diluted flow to yield, after conversion, the mass emissions during the test.

The gasoline and diesel test cycles (Appendix I) are composed of second-by-second sequences of engine speed/torque pairs, with values given in normalized (percent of maximum) form. These cycles were computer-generated from a large data base of urban heavy-duty engine operation. Using as a sample 88 trucks and buses in Los Angeles and New York, EPA gathered actual in-use operational data. The information was separated by fuel type, city, and road type and reduced by computer to 5-minute schedules. EPA linked the short cycles together, arriving at the two published test cycles.

The normalized torque values in the test cycles appear in terms of a percentage of the engine's maximum torque at the current speed. The first step in conducting a test is to determine the maximum torque at each speed, a process called "mapping"; actual speed and torque numbers can then be substituted for the normalized values. Once the engine has been mapped, the computer is ready to run the engine. However, the test is conducted in two halves, a cold-start portion and a hot-start portion. The engine oil must have returned to ambient temperatures for the cold-start portion to begin. This means that the engine must be cooled, either through resting (soaking) for several hours or through a "forced cool-down" process allowed by the regulations to accelerate engine cooling.

Gasoline engine and diesel test runs are conducted in the same way. The standard-equipment starter is used to start the "cold" engine, which is then allowed to idle freely for approximately 15 seconds until the actual cycle begins. Approximately twenty minutes of transient operation follows. Separating this cold-start segment from its identical hot-start counterpart is a twenty-minute soak period.

Emissions during the transient test are directly analyzed (diesels) or bagged and analyzed (gasoline engines) separately for the cold-start and the hot-start segments. It is possible then to weigh the emissions according to the number of cold-starts vs. hot-starts that are found to occur in the field (a cold-start to hot-start ratio of 1:7 is used for both gasoline and diesel tests). Accordingly, the mass of a pollutant emitted over each of the two cycle segments and the work done by the engine during the two segments are calculated; the hot/cold weighting is applied to the resulting grams and the BHP-hrs; and a final calculation yields a weighted g/BHP-hr emission result for that pollutant.

If an idle test is to be performed, it occurs after the cold-start/hot soak/hot-start transient test sequence. The detailed procedure for conducting an idle test may be found in Subpart P of the regulations; a brief description appears here.

The idle test procedure is much less complex than the transient procedure and requires considerably less specialized sampling and analytical equipment. The test is conducted at normal operating temperatures and emission measurements can be made directly without dilution. These distinct aspects of the design of idle test will allow its straightforward application to in-use testing programs. Section 207(b) of the Act requires the development of a short test that is correlatable with the certification test to precede the promulgation of heavy-duty emission warranty regulations. Since a short idle test is now incorporated into the standard emission test sequence, an application of the idle test in the field correlates by definition. This facilitating of the promulgation of prescribed warranty regulations and associated air quality benefits provide a primary justification for the introduction of the idle test. Basing I/M tests on an established certification test will allow tighter "cutpoints" and hence will increase the number of deficient and failed catalysts which are caught. And if heavy-duty inspection and maintenance programs become widespread, one would expect some degree of air-quality benefit to accrue from the correcting of inservice emissions failures.

Additionally, though we have not quantified a decrease in CO emissions as a direct result of the idle test, the very small cost will make even a minimal CO reduction cost effective. And such a reduction in idle CO emissions would be most apparent in such places as crosswalks and loading docks where there is fairly direct exposure to people. Finally, idle operation was shown to be the single most common mode of urban heavy-duty operation; the separate idle test and standard will discourage a trading off of idle emissions control.

The transient test procedures are organized in Subpart N of the regulations so as to follow the structure of the light-duty regulations. The reader will find many sections to be in common.

C. Redefinition of "Useful Life"

These new heavy-duty engine regulations incorporate a revised definition for the "useful life" of an engine. Currently defined as 10 years, 100,000 miles or 3,000 hours of operation (whichever occurs first) for diesel engines and 5 years, 50,000 miles, or 1,500 hours of operation for gasoline engines, the useful life approximates

only half or less of the expected lifetime of the respective engine types. The new concept of useful life, in contrast, focuses on the actual total lifetime. Congress has provided EPA with wide latitude to define useful life when the Administrator determines that a duration of mileage greater than the useful life Congress prescribed for light-duty vehicles is appropriate. It is certainly appropriate in the case of heavy-duty engines and vehicles to extend the useful life beyond the 5-year or 50,000-mile limit applicable to light-duty vehicles to the extent provided by this rulemaking.

The revised useful life definition will create a strong incentive to manufacturers to produce emission controls as durable as the engines themselves. Heavy-duty engines, particularly diesel engines, tend to last longer than light-duty vehicles. The useful life definition will result in significant air quality benefits as is discussed below. Also, the 50,000-mile five-year useful life definition established by Congress for light-duty vehicles was adopted at a time when mobile source emission control technology and mobile source emission regulation were both in their infancy. Congress did not know in 1970 what control systems or engine designs manufacturers would employ to meet the standards; the technology simply had not been developed and Congress was seeking to "force" its development by setting very stringent standards. Relatively little was known regarding the impact of emission control warranties on the manufacturers. Consequently, Congress followed a very cautious approach by limiting warranty liability of light-duty manufacturers through the adoption of the 50,000-mile/five-year definition of useful life.

Today we know a great deal more about emission control technology and about the attendant implications of emission control warranties. In considering the technological feasibility of the emission standards for heavy-duty engines, the revised definition of useful life was factored in. The precise emission control technology that will (or can be) utilized to meet these standards is known and will be available. The warranty implications of the standards have been considered (see discussion in Part I of the Summary of Comments Section) and should not prove problematic to the manufacturers.

These regulations alter the manner in which the useful life is determined for heavy-duty engines. Instead of simply using a standard EPA-defined value, manufacturers will *themselves* establish for each engine family two indicators of engine life. The first of these is the average period of use up to engine retirement or rebuild. The average period of use cannot be shorter than the engine's basic mechanical warranty or 50,000-miles, whichever is greater. The manufacturers are to base their useful life values on survey information of in-service engines or durability testing of prototype engines.

Secondly, in addition to establishing an average period of use, these regulations will also require that the manufacturers submit information to define the circumstances under which an engine can be considered to need rebuilding. That is, a manufacturer will determine for each engine family what numerical results from a compression test and a measure of oil consumption and of bearing failure indicate that the engine has reached the end of its specific useful life (the manufacturer may add additional criteria). Thus, for each individual engine, an objective, measurable limit will exist to its use in durability testing or, in the field, to its coverage under the emission warranties. Finally, these rebuild criteria—as well as the average period of use—will be mentioned to the owner on an engine label and further explained in the owner's manual.

The end of the useful life of a given heavy-duty engine, then, is defined by one of two limits, whichever is reached first. Either the engine exceeds the average amount of service seen by its engine family or it deteriorates to the point of needing to be rebuilt. In no instance, however, may this actual useful life be less than the current legal minimum useful life of 50,000 miles for heavy-duty engines specified in Section 202(d) of the Clean Air Act.

The ramifications of these changes in the useful life definitions are broad. When EPA finalizes in-use durability testing, the useful life concept will delineate the durability testing program during certification. Thus, each durability engine will be run until it reaches the end of its actual useful life. Similarly, the useful life provides an endpoint to the manufacturer's warranty on emission control systems.

D. Revisions to Certification Procedures

In addition to the new concept of a full-life useful life, EPA is in these regulations making other changes in the design of the certification process. Significantly different approaches both to durability testing and to the engine maintenance which may be performed during that testing emphasize EPA's desire to encourage longevity in the design of emission control systems. The same underlying goal, to keep emission controls functioning properly on the road, has also led to "parameter adjustment" provisions which should encourage the design of more tamper-proof controls. How these three components will fit into the certification process is discussed next.

1. Revised Durability Testing requirements. EPA is postponing the finalizing of the new durability testing requirements, which like the revised useful life definition, will shift more of the responsiblity for EPA's emission control program to the manufacturer. Since the NPRM indicated that we would waive in-use durability requirements for the 1983 and 1984 model years anyway, delaying its finalization simply deletes the waived provisions. We plan to further analyze the design of the durability program and finalize regulations on a time line consistent with the finalization of the statutory NO_x standards. Therefore, until the new provisions are finalized, manufacturers will design their own testing procedures for determining emission deterioration factors. The manufacturers are required to comply with the allowable maintenance provisions, as applicable. A description of these procedures must be submitted to EPA, but we will not approve or disapprove them.

On the other hand, the multiplicative deterioration-factor provisions *are* being finalized. They have no relationship to the in-use durability requirements and need not be postponed.

2. Allowable Maintenance Regulations The new durability requirements when they are promulgated will improve the quality of durability testing in order to better assess the deterioration of emission controls; the allowable maintenance provisions will put restrictions on the maintenance which may be done during that testing (as well as the testing used to measure emissions deterioration under these 1984 regulations) to encourage the design of long-lived emission control components. Thus, both of these sets of provisions have the central purpose of making the durability of emission systems a major design goal.

Emission-related maintenance (as defined in Subpart A, Section 86.084–2) on engines, subsystems, or components used to determine the deterioration of emission controls will be limited to that which is technologically necessary. EPA has established minimum technologically necessary intervals for a number of emission-related components. This maintenance is also that which will be recommended to the owner in the operator's manual. The manufacturer

may recommend more frequent maintenance, as long as the instructions for such additional maintenance are clearly differentiated (in a format approved by the Administrator) from the emission-related maintenance approved under Section 86.084–25(c). Performance of this additional maintenance may not be made a prerequisite to emission warranty coverage. It may be appropriate for a manufacturer to require additional maintenance as a precondition to warranty coverage if such maintenance is necessary to offset the effect of severe and abnormal operating conditions. These issues are a proper subject to be considered in the course of developing performance warranty regulations under Section 207(b) of the Act.

The basis for defining the "technologically necessary" maintenance intervals for most of the components addressed was the longest interval that any manufacturer recommended for that item. With proper emphasis placed on durable, low-maintenance designs, it is reasoned, manufacturers will opt for the best available technology (from a maintenance perspective) for their emission related components. Thus, the minimum level of maintenance currently required for an item should be a lower limit for the 1984 maintenance interval.

The case of the catalyst replacement interval is unique in that experience does not exist with properly-sized, properly-loaded, heavy-duty catalysts. EPA has had to rely on light-duty experience, a knowledge of the physical phenomena associated with loss of catalyst efficiency, and limited testing to arrive at a best judgment regarding the durability of 1984 model year heavy-duty converters. The EPA analysis (see Summary and Analysis of Comments, Allowable Maintenance issue) concludes that such catalysts can be expected to be functional for about 114,000 miles (the estimated life expectancy for gasoline heavy-duty engines). Information shows that if they are protected against high temperatures, current-technology catalysts do not fail catastrophically and that they actually degrade less rapidly with time. Proper sizing, loading, and placement of the catalyst, as well as special motoring-mode protection, remove the threat of physical failure in heavy-duty applications. However, the provisions allow the manufacturer to recommend a catalyst replacement at 100,000 miles.

EPA has decided to postpone the provisions of the second criterion regarding a prospective maintenance interval—that there is a "reasonable likelihood" that the owners will actually perform the maintenance at that interval. The requirement for meeting this second criterion is being removed from these regulations, but it will probably be reproposed with the forthcoming NO_x regulations.

We believe the manufacturer will be able to show that proper maintenance is being done in the field with respect to such maintenance as spark plug and ignition wire replacement. Therefore, it is not so necessary that in-use performance be demonstrated. However, when NO_x control regulations are promulgated, oxygen sensors may be employed to control closed-loop catalyst systems. Oxygen sensor maintenance is an item for which EPA is likely to need assurance that owners are properly performing it. Consequently, such requirements may be reproposed in the future.

The regulations distinguish between emission-related maintenance and non-emission related maintenance. This distinction is solely for the purposes of engine certification. The Agency recognizes that an owner's failure to perform "nonemission related maintenance" could result in an in-use vehicle's failure to comply with emission standards and could in some instances relieve a vehicle manufacturer from emission warranty liability. For this reason, some of these maintenance items could be subject to regulation in future maintenance instruction regulations.

3. Parameter Adjustment Regulations. The final major change in the current certification process is directed at the emission testing itself. EPA will be allowed during a test to adjust (or require the manufacturer to adjust) certain emission-related parameters to any setting within the physically adjustable range. To make sure that the tests can be passed, the manufacturers are expected to restrict the adjustability of the parameters.

The incidence of in-use maladjustment of heavy-duty engines should decrease as a result of these regulations. Maladjustment is a serious problem in the light-duty vehicle fleet; heavy-duty inspection/maintenance data from Oregon and New Jersey indicate that the heavy-duty population is afflicted by maladjustment as well. These parameter adjustment regulations are patterned very closely after those recently promulgated for light-duty vehicles and are authorized under Sections 202, 206, and 301 of the amended Clean Air Act.

For diesel engines, parameter adjustment provisions are being established, but as yet no specific parameters fall under the requirements. Thus, diesels are effectively exempt for the time being. The Administrator may at any time require that a specific parameter be adjusted during testing provided that he/she makes the following determinations: (1) the parameter is being maladjusted in the field, (2) such maladjustment has a significant effect on emissions, and (3) due consideration has been given to leadtime. These provisions are identical to those currently in place for light-duty diesel-powered vehicles.

On the other hand, four parameters are subject to adjustment during the testing of gasoline engines: idle fuel-air mixture, idle speed, idle spark timing, and choke valve action. In the same manner as with diesels, the Administrator may determine that additional emission-related parameters should be added to this list.

Since these provisions affect engine emission tests, their applicability reaches into all aspects of EPA's emission control program that require standard heavy-duty testing. Thus, parameters may be adjusted during the testing of emission-data and durability-data engines and during Selective Enforcement auditing (indeed, separate parameter adjustment regulations exist within the auditing rules).

E. Selective Enforcement Auditing

Background: Selective Enforcement Auditing (SEA) is an emission testing program authorized by Section 206(b) of the Clean Air Act for new production engines as they leave the assembly line. Similarly, Section 206(g) requires testing as necessary, according to promulgated regulations, to determine the extent that vehicles are not in compliance with the requirements of the Act for the purpose of assessing non-conformance penalties (see Paragraph G, Public Participation Section "Production Compliance Auditing and Nonconformance Penalties").

EPA has determined that the Clean Air Act requires that eventually, every car coming off the assembly line should meet the emission standards established under Section 202. The SEA program is used to determine compliance with emission standards, after adjustment for deterioration, as production engines leave the assembly line. The program employs a 10 percent Acceptable Quality Level (AQL), which imposes a significant risk of loss (5 percent or greater) of certification if 10 percent of an engine configuration is out of compliance. The 10 percent AQL allows for emissions measurement error and quality control aberrations which cannot be totally eliminated at the

assembly line. Therefore, a 10 percent AQL in effect requires every heavy-duty production engine to meet applicable emission standards.

An "every source" approach was also adopted by EPA in its SEA programs to determine compliance of portable air compressors and medium and heavy trucks with applicable noise emission standards under the Noise Act, which also contemplates that every source meets the standards. See 41 FR 2162 (January 14, 1976) and 41 FR 15538 (April 13, 1976). A 10 percent AQL SEA program was promulgated in both cases. In addressing comments on the AQL in the compressor regulation, EPA stated:

> * * * the basic requirements still remain that a manufacturer is prohibited from distributing into commerce any products which do not conform with the standard. The basic intent is that all products being distributed in commerce must conform to the standard. Any product that is tested and which is known not to conform to the standards may not be distributed into commerce until the nonconformity is remedied. Furthermore, every compressor is warranted to conform to the standard at the time of sale * * * (41 FR 2167).

In promulgating a 10 percent AQL for truck noise emissions, EPA stated:

> An AQL of 10 percent was chosen to take into account some test variability and random production errors. (41 FR 15539).

A 10 percent AQL also was proposed for the SEA program for light-duty vehicles (39 FR 45360 (1974)). However, the manufacturers claimed that the 10 percent AQL would be economically disastrous. As stated in the preamble to those final regulations (41 FR 31474, July 28, 1976), the manufacturers

> claimed that, if implemented, it [10 percent AQL] would result in loss of certification for a majority of their engine families, with consequent repercussions on employment and profitability, and that, even if it could be met, could only be done by adding more emission control equipment, thus decreasing fuel economy and increasing sulfate emissions and price.

EPA recognized that in order to bring noncomplying engine families into compliance, manufacturers would have to make significant improvements in quality control and in some cases lower the engineering design targets for these families. The agency acknowledged that:

> these kinds of changes could not be made on short notice and would require some reasonable period of time to institute. (41 FR 31473)

A 40 percent AQL was adopted for the light-duty vehicle SEA regulations to implement SEA in a manner not unreasonably burdensome to the auto companies. EPA explained that:

> The approach taken here, then, of not setting the AQL at 10 percent will provide manufacturers the time and flexibility to bring all their vehicles into conformance with the standards on a reasonable schedule. Such a schedule can be compatible with their parallel efforts to improve fuel economy and which does not expose them unduly to the risk of loss of certification while they are learning to bring their production vehicles into compliance with the law. (41 FR 31475)

In contrast to the SEA for new light-duty vehicles, which would have required significant quality control upgrading on short notice if the 10 percent AQL was adopted, the SEA for heavy-duty engines is not scheduled for implementation until the 1984 model year. Engine manufacturers will have sufficient lead time to acquire the necessary test equipment, develop and apply the necessary emission control technology, and certify their engines. Heavy-duty gasoline engine manufacturers will be able to utilize catalyst control technology currently used on light duty vehicles and trucks, and diesel engine manufacturers should not have significant developmental needs as their engines are already close to compliance. It is EPA's judgment, as expressed in its technological feasibility and cost analyses, that both heavy-duty gasoline and diesel engines, using the new testing procedures, can comply with the emission levels associated with a 10 percent AQL. Thus, the severe effects anticipated by light-duty vehicle manufacturers due to immediate imposition of a 10 percent AQL (adverse employment and profitability repercussions and the loss of certification) are not likely to be manifested in the heavy-duty engine industry as a result of this rulemaking.

In addition, no data or analyses were submitted which demonstrated that going from a 40 percent AQL to a 10 percent AQL would adversely impact fuel economy, increase non-regulated pollutants such as sulfates or require additional emission control equipment. Further, an EPA cost-effectiveness study which analyzed the difference between a 40 and 10 percent AQL concluded that the 10 percent AQL has a favorable cost-effectiveness ratio.

Finally, EPA has determined that a nonconformance penalty (NCP) should be made available to heavy duty engine manufacturers who are unable to obtain a certificate of conformity or whose engines fail to comply with the emission requirements during an SEA. The noncompliance penalty provisions are discussed further in Paragraph F of the Public Participation section (Production Compliance Auditing and Nonconformance Penalties). A manufacturer who elects to pay such a penalty upon failure of an SEA may continue to produce noncomplying engines in lieu of bringing the engines into compliance.

SEA Audit Procedures: The process of conducting an SEA audit begins with a test order issued by EPA to a manufacturer. The test order is issued either for purposes of general surveillance or in response to evidence indicating noncompliance. If a manufacturer conducts its own assembly-line testing program, the data will help EPA determine compliance with the standards. The manufacturer is required to report these test results to EPA as authorized in Section 208(a) of the Clean Air Act.

Each manufacturer will be assigned a limit on the number of test orders which EPA may issue during a model year, based on its projected annual sales. Every test order will count against a manufacturer's annual limit, with two qualifications. Test orders that indicate a manufacturer's engine configuration has not passed and SEA will not count against the limit. Also, in cases where the annual limit has been met, additional test orders may be issued in response to evidence indicating noncompliance.

The test order will instruct the manufacturer to test the specified engines or to make them available for Agency testing. EPA Enforcement Officers are authorized to enter the production and test facilities, upon manufacturer consent, to monitor SEA-related activities; a court order or warrant may be issued if entry is denied.

Test orders will specify the manner and location of the selection of engines. The "sequential" design of the sampling plans provides sufficient flexibility in sample selection so as not to unduly impact a manufacturer's normal production activities.

The manufacturer may "break-in" engines before testing, up to a maximum of 125 hours. After break-in, transient and idle tests (and, in the case of diesel engines, smoke tests) are performed to determine engine emissions. The emission test procedures are identical to the test procedures used in certification. After the emission levels are adjusted to account for deterioration, they are compared to the standards and a determination of "pass" or "fail" is made for each engine for each pollutant. The manufacturer is expected to complete at least two tests per day. "Low volume" manufacturers (predicted sales of less than 30,000 per year) are required to complete one test per day. This requirement provides the obvious

benefits for both EPA and the manufacturer of expediting the completion of the audit.

An audit decision is reached using the "sample inspection criteria" tables found in the regulations. Engines are sequentially tested until the number of passed engines corresponds to a "pass" number on the table or the number of failed engines corresponds to a "fail" number. Classifying engines as either passing or failing rather than examining their numerical emission levels reflects an "attributes" rather than a "variables" decision-making approach. (The "variables" approach was not practical because of the uncertainty in defining the distribution of emissions among heavy-duty production engines.)

Failure of a SEA audit may result in suspension or revocation of the certificate of conformity for that configuration. To have the certificate reinstated subsequent to a suspension, or reissued subsequent to a revocation, the manufacturer must demonstrate, by passing a follow-up SEA audit, that improvements, modifications, or replacement have brought the original engine configuration, the modified engine configuration, or its replacement into compliance. The regulations include hearing provisions which allow the manufacturer to challenge EPA's suspension or revocation decision based on application of the sampling plans or the manner in which the tests were conducted.

F. Production Compliance Auditing and Nonconformance Penalties

EPA believes that both diesel and gasoline heavy-duty engine manufacturers will be able to meet the requirements prescribed in these regulations by 1984. In the NPRM, we had proposed setting the "upper limit" for noncompliance equal to the standard, which would have made nonconformance penalties unavailable. However, to provide for isolated instances when compliance may not be achieved, EPA plans to propose a program to allow certification of engines which exceed the standards, but which do not exceed a designated "upper limit," if a "nonconformance penalty" (NCP) is paid by the manufacturer. The size of the penalty will depend, in part, on the extent by which the emissions exceed the standards, as determined by Production Compliance Auditing (PCA).

As part of the separate rulemaking providing for the nonconformance penalties, EPA will propose the "upper limit" on certification and the marginal cost component of the general penalty formula. EPA plans to propose PCA/NCP similar to the form in which it was originally proposed as part of Subpart K (see 44 FR 9469, 9470, 9490, and 9492, §§ 86.1011–83 and 86.1013–83). The rulemaking will allow for public comment on the proposed upper limit and marginal cost numbers; as well as all other aspects of the PCA/NCP methodology. EPA anticipates publication of its NPRM for the NCP by early 1980.

The Agency has determined that proposal and promulgation of nonconformance penalties does not affect leadtime requirements for compliance with statutory emission standards. With the promulgation of standards in this rulemaking, the manufacturers are expected to begin making good faith efforts towards complying with all aspects of the final regulation. The future availability of nonconformance penalties should not be viewed as a mechanism allowing a manufacturer to design to higher emission levels. EPA intends to structure the penalty, as required by law, to remove any competitive disadvantage to complying manufacturers.

III. Leadtime

EPA has determined that both the gasoline and diesel engine manufacturers will be able to comply with these regulations by the 1984 model year. Our analysis, based substantially on information submitted by the manufacturers, shows that certification should be complete several months in advance of the beginning of the production of 1984 engines.

Looking first at the gasoline engine manufacturers, EPA estimates that the entire pre-certification process can be completed by all 4 manufacturers before the end of 1982. The conversion of dynamometers to transient-control is the limiting factor in the projected timetable. If the first one or two test cells that become operational are utilized for preliminary technology assessment, development research can begin before the end of 1980 and expand as the further cells are completed. Eighteen months of development work and 7 months of certification will cause the manufacturers to overshoot the beginning of 1983 production. While it appears feasible to compress the schedule with an all-out effort to meet the 1983 model year, EPA has concluded that there is too high a risk associated with such a program and has decided to promulgate for 1984. This risk is associated with the uncertainty that all pre-certification work would be completed in time for 1983 certification. Thus, when the effective model year is rolled back to 1984, the EPA projection provide some 10 months of "cushion" for 1984 certification; we expect this timetable to cover unforeseen delays. Though this schedule is more compressed than those submitted by some of the manufacturers, each of the companies will be able to certify their engines for 1984 in a properly-managed program.

The design of a pre-certification timetable for diesel manufacturers clearly differs from that of the gasoline engine makers, primarily because of equipment requirements. Currently, diesel development work is done on eddy-current dynamometers (which absorb energy but lack the capability of driving (motoring) the engine). Conversion to transient control will require the replacement of these machines with electric motoring dynamometers (unless the option described later in this section is pursued). All of the major manufacturers have begun procurement of at least one advance cell, but they disagree on the time required for additional development dynamometers. Caterpillar expected that construction of a new facility alone would last three years, and IH desires to postpone the acquisition of new equipment until EPA finalizes particulate standards. Yet both of these obstacles can be avoided—Caterpillar's by making efficient use of existing facilities during construction and IH's by a simple corporate decision to pursue 1984 certification. By September 1981, all manufacturers should have transient test cells operating and development will have begun.

EPA has carefully studied the various company estimates of the time required for development work. The differing amounts of work required among diesel engine families to bring them into compliance will facilitate the efficient use of cells as they become available (engines needing the most work would be placed in the earliest cells). Also, most engine families that will require work are reasonably close to the target levels already. With such factors acting in favor of the industry, 14 to 16 months of engine development work should be sufficient. Durability testing and certification stretch the process into 1983, leaving about 7 additional months before 1984 production. However, it might be possible for the diesel manufacturers to comply by 1983, especially if development efforts were accelerated.

There is a possible alternative route available to the diesel manufacturers. It arises because it may be possible that an eddy-current dynamometer could be

converted to transient control and adequately run a modified transient test. While eliminating the cost of dynamometer replacement, this option suffers from the uncertainty that the operation of such a system would sufficiently mirror that of an electric dynamometer. Thus, a system would have to be built up and proven before a manufacturer could commit to further procurement. The resulting effect on the total precertification process is a 4-month extension of the schedule outlined above. Because of this delay, we expect that few, if any, manufacturers will use this option. To remove some of the risk, however, EPA will allow the option of certification on the current 13-mode procedure for one additional year (the 1984 model year). A standard which "roughly" corresponds to the transient HC standard and a separate NO_x standard have been developed to minimize the loss of air quality benefits.

Congress intended (and EPA originally proposed) that the statutorily-inposed HC and CO standard would become effective with the 1983 model year. However, Congress also anticipated that standards representing a 90 percent reduction or, if appropriate, revised standards would be in place no later than December 31, 1978. What neither Congress nor EPA anticipated at the time the 1977 Amendments were enacted was the additional time necessary to develop a test procedure designed to ensure that the significant reductions in HC and CO emissions that Congress sought would actually be achieved. The Agency is running about a year behind the schedule for implementation that Congress had expected. Delaying the effective date one additional year until the 1984 model year to ensure that manufacturers will have adequate leadtime to meet the requirements is also consistent with the leadtime requirements identified by Congress by Section 202. However, it should be noted that it is the Agency's view that had it been clearly evident that sufficient leadtime existed to permit the manufacturers to comply with the statutory standards in 1983, Congress' desire to have the standards take effect in the 1983 model year would have taken precedent over any expressions concerning leadtime to which the manufacturers might otherwise have been entitled to under Section 202.

IV. Feasibility of Compliance

The foregoing assertion that the 1984 model year deadline can be met by both gasoline and diesel engine manufacturers necessarily carries the implication that meeting the requirements of the regulations is feasible. Indeed, a detailed EPA analysis shows that widespread compliance is attainable by the manufacturers.

Based upon a rough correlation between the 13-mode test procedure and the transient test results, EPA projects that 36 percent of the diesel engine families already will emit at or below target emission levels (as derived from expected deterioration factors, 10 percent Acceptable Quality Level, and manufacturers' engine-to-engine emissions variability with little or no modification). Among the remaining families, most will require only modest improvements. The approaches that EPA anticipates for achieving the targets are not new; such things as injector spray pattern and sac volume, after-cooling of turbocharged intake flows, and turbocharging of naturally-aspirated engines are available paths to compliance. The demonstrated ability on the part of manufacturers to improve the emissions characteristics of some of their engines (particularly Cummins and Caterpillar) strongly supports EPA's conclusions.

The feasibility of the gasoline manufacturers' reaching their target emission levels actually depends primarily on the use of properly-sized and loaded catalytic converters. Additional air injection to increase catalyst oxidation will further improve HC and CO emission levels. EPA has recently demonstrated that gasoline engines equipped with properly-sized and loaded catalysts and appropriate air injection can achieve emission levels well below the projected target levels needed to meet the standards at a 10 percent AQL. Finally, the essentially decontrolled level of NO_x which the standard in these regulations represents for most engines should allow considerable flexibility in achieving design goal emission performance.

V. Effect on the Environment

By reducing the amount of hydrocarbons (HC) and carbon monoxide (CO) emitted into the atmosphere by heavy-duty gasoline and diesel engines, this rulemaking package will contribute significantly to improving the average ambient air quality in the U.S. An extensive EPA air quality analysis is presented in the Regulatory Analysis. This work shows that if the regulations are implemented, the average heavy-duty gasoline engine will emit over its lifetime one ton less HC and 29 tons less CO. Similarly, the HC reduction from the average heavy-duty diesel will be 0.8 tons. When translated into air quality improvement, this means that the average urban level of ozone will be 2 percent lower by the late 1990's. Likewise, CO air quality will improve 7 percent. Because of inaccuracies in the modeling techniques, conclusions about the effect of these reductions on the ability of specific regions to meet the ozone and CO ambient air quality standards cannot be reached with statistical confidence. However, the reductions are of sufficient magnitude that if certain regions are within a few percent of the standards in the 1990's, the control of heavy-duty engine emissions could bring them into compliance.

EPA's analysis indicates that because of the introduction of catalysts into the heavy-duty gasoline vehicle fleet urban mass emissions of sulfuric acid will rise, but only slightly. Lead emissions will be practically eliminated because of the shift to lead-free gasoline. Finally, complying with the regulations should not adversely impact water quality, the ability of manufacturers to meet future noise standards, or energy consumption (see Fuel Economy below).

VI. Economic Impact

The implementation of these regulations will require each manufacturer of heavy-duty engines to direct additional capital toward facility modifications, equipment purchases, emission control hardware, and expanded testing and research. These costs will, for the most part, be passed along to the engine buyers, who will see the effect as an increase in the first cost of the engines. Additionally, owners of gasoline engines will experience some increase in their operating costs due to the need for leadfree fuel.

The increased costs felt initially by the manufacturers will vary widely primarily because of differing equipment requirements. Accordingly, EPA has performed careful, detailed analyses of the costs for each individual company. The first-cost-increases which appear below, however, are averages for the gasoline and diesel industries.

The higher prices expected for gasoline engines are attributable mainly to the additional hardware requirements inherent in the use of oxidation catalyst technology (catalysts, improved air pumps, stainless steel exhaust system, etc.); incidental costs for test facilities and research/development are small on a per-engine basis. EPA estimates that compliance with this rulemaking will result in a purchase price increase of the average gasoline heavy-duty engine by as much as $394, or about 3 percent of the total purchase price.

As suggested above, an additional economic burden will fall to the users of

gasoline engines. The standards are such that oxidation catalyst systems will be necessary in 1984. The tetraethyl lead in regular gasolines quickly poisons catalysts, so, like light-duty vehicles, heavy-duty gasoline engines will need to run on unleaded fuel. However, the use of lead-free fuel will extend the lives of the spark plugs and exhaust system. When the additional cost of using more expensive unleaded fuel is offset by these equipment replacement savings, a *net* increase of about $83 results in the lifetime operating costs of a gasoline-powered heavy-duty vehicle.[4]

Diesel manufacturers are expected to bring most of the engines which need work into compliance with relatively minor adjustments to the engine itself. Add-on hardware such as aftercoolers, exhaust gas recirculation, and diesel crankcase controls, will be required on engines representing roughly 12 percent of expected sales. The non-hardware changes will be in such things as injector design and timing, and additional hardware will be in the form of aftercoolers and exhaust gas recirculation (EGR) systems. An average diesel engine retail price increase of $195 will be borne by the buyer (about one-half of 1 percent of the total price) if all costs are assumed to be passed along.

In summary, the aggregate 5-year cost of these regulations (1984–88) is estimated to be $948 million (present value at the start of 1984 assuming 10 percent discount rate). The aggregate 5-year cost for gasoline-fueled vehicles above is estimated at $705 million and for diesel vehicles, $243 million. Of the total cost, $122 million is attributable to the increased cost of unleaded fuel for gasoline-fueled vehicles (including offsetting savings).

Because of the anticipated improvement in gasoline engine fuel economy (see Fuel Economy, below), the operating costs for gasoline engines—and hence the total cost of the package—are expected to be reduced. Savings in fuel costs that will be seen by the operator of a gasoline engine are projected to amount to at least $788 over the life of the engine, based on the *low* end of the anticipated range of fuel economy improvements. The effect of this benefit on the aggregate cost of the rulemaking is to reduce it by $1.26 billion, yielding an aggregate cost of *negative* $313 million (−$557 million for gasoline engines and $243 million for diesels).

[4] For simplicity, the savings in this calculation actually include a small component which is not attributable to the introduction of unleaded fuel—a stainless steel exhaust system.

VII. Cost Effectiveness

Cost effectiveness is a measure of the "economic efficiency" of a regulatory action, in this case expressed as dollars of cost per ton of pollutant reduced. We have pursued two distinctly separate approaches to the cost effectiveness of this rulemaking, an incremental analysis and an integrated approach. The incremental analysis has been performed as a measure of the effect of removing each of the several individual elements which make up the package. The second approach is that of determining the cost effectiveness of the entire package as an integrated strategy. Because of the interrelationships among the various components of the package, the benefits of components can overlap and enhance one another. Thus, it would be improper to total the incremental costs and benefits to obtain an overall figure for the package since there would be a considerable amount of double counting. The integrated cost effectiveness analysis must be used to evaluate overall costs and benefits.

The results of the incremental analyses for gasoline and diesel engines appear in the following tables, reprinted from the Regulatory Analysis. Because each component is treated separately, the incremental analysis in effect represents an analysis of various alternative regulation packages. For example, the cost effectiveness of a package which excludes parameter adjustment is found by subtracting the parameter adjustment cost and the benefit from those for the overall package. Thus, in this example, $472 in cost, divided among a 0.92 ton HC benefit and a 25.0 ton CO benefit, yields HC and CO cost-effectiveness numbers of $256/ton and $8.3/ton, respectively. (The transient test was evaluated in relation to achieving a 90 percent reduction using the steady-state test.) The reader is encouraged to examine the careful, detailed cost-effectiveness analysis of these individual components in the Regulatory Analysis, Cost Effectiveness chapter.

Table 1.—*Incremental Lifetime Cost Effectiveness Gasoline-Fueled Engines*

Option	Cost	Benefit (tons)		Cost effectiveness (ton)	
		HC	CO	HC	CO
90 pct on 9-mode [1]	$426	0.61	16	$349	$13
Transient test	51	.39	12.6	65	2
Useful life	58	.13	3.8	223	8
Parameter adjustment	5	.08	3.6	31	1
Allowable maintenance	58	.13	3.8	223	8

Table 1.—*Incremental Lifetime Cost Effectiveness Gasoline-Fueled Engines*—Continued

Option	Cost	Benefit (tons)		Cost effectiveness (ton)	
		HC	CO	HC	CO
10 pct AQL	17	.04	.5	213	17
Overall package	477	1.0	28.6	238	8
a. Transient test.					
b. Useful life.					
c. Parameter adjustment.					
d. Allowable maintenance.					
e. 10 pct AQL.					
I/M	29	.07	2.3	207	6

[1] Includes all other aspects of the rulemaking except the transient test.

Table 2.—*Incremental Lifetime Cost Effectiveness Diesel Engines*

Option	Cost	Benefit (tons HC)	Cost effectiveness (ton)
Steady-State test	$85	0.28	$304
Transient test	110	.49	224
Useful life	2	.05	40
Allowable maintenance	5	.05	100
10 pct AQL	7	.24	29
Crankcase control [1]	10	[2]19.50	342
Overall package	195	.77	253
a. Transient test			
b. Useful life			
c. 10 pct AQL			
d. Crankcase control			

[1] Naturally-aspirated engines only. Cost allocated over 3 pollutants. See diesel crankcase emission control, summary and analysis of comments.
[2] Pounds.

The table below presents the cost effectiveness of the integrated package with respect to both gasoline-fueled engines and diesels. The costs used in calculating these values represent the present worth on January 1, 1984 using a discount rate of 10 percent.

	Cost effectiveness (ton) pollutant		
	HC	CO	NO_x
Gasoline-fueled engines	$273	$10	
Diesel engines	308		

When these cost-effectiveness numbers are compared to those of other HC and CO control programs, it is clear that this regulation package is indeed cost effective.

Note.—The analysis which led to these numbers does not include the savings associated with fuel economy gains. If these savings are included, the cost effectiveness for gasoline engines becomes negative (−$150/ton for HC and −$5/ton for CO). The case for diesels is unchanged. Since the fuel economy gains are associated with catalyst technology and the base case for the

incremental analysis assumes catalyst technology, the incremental cost effectiveness numbers are not affected.

VIII. Role of Inspection and Maintenance (I/M)

While this rulemaking contains no specific reliance on I/M programs and thus claims no related costs or benefits, there are ways in which I/M would enhance the effectiveness of the rulemaking. When it is viewed as an "insurance policy," I/M can be seen to protect against the loss of air quality benefits to such problems as misfueling or tampering. Up to 8 percent of light-duty vehicles are currently misfueled with leaded gasoline, largely in response to economic incentive to do so—the same incentive that will undoubtedly cause a degree of misfueling in heavy-duty gasoline engines. Tampering (e.g., removal of the catalyst) would also be discouraged by heavy-duty I/M programs. Thus, the establishment of heavy-duty I/M can help realize the full potential of these regulations.

It could be argued that I/M might secure the same benefit as certain other provisions of this rulemaking which exist, in part, to improve in-use emission control. The extension of the useful life definition and the introduction of parameter adjustment and allowable maintenance regulations, however, differ in concept from I/M in that they require the manufacturers to build more durable and tamper-resistant emission control systems. It is considerably less expensive to the consumer to pay for long-lived designs than to pay for replacement in the field. (We have calculated the incremental cost of a full-life catalyst over a half-life design to be $58; this compares to a $481 aftermarket replacement.) Thus, these components of the package have a clear place in the emission control program independent of the establishment of heavy-duty I/M.

We see I/M as a necessary provision to assure that the program will not be subverted due to misfueling and tampering. However, I/M is more cost effective as an insurance policy to back up a program based on durable control system designs than as a program to force repeated in-field maintenance on non-durable equipment.

IX. Fuel Economy

EPA believes that no increase in fuel consumption in either gasoline engines or diesels will accompany the enactment of these regulations. We do expect some manufacturers will use emission-control hardware that will cause a slight fuel economy penalty, for example, larger air pumps on gasoline engines and exhaust gas recirculation on diesels. Yet the beneficial effects of other control systems will offset these losses and are expected to result in net fuel economy gain, particularly in gasoline engines.

The shift in the gasoline engine industry to oxidation catalysts will permit freer adjustment of the carburetor to maximize fuel economy. Similarly such approaches to diesel HC and CO reduction as after cooling, injector design, and combustion chamber changes can improve fuel efficiency.

Thus, despite the common criticism of EPA that emission controls reduce fuel efficiency, the EPA staff has performed an analysis (see Summary and Analysis of Comments, Fuel Economy issue) which concludes that the introduction of catalysts will allow gasoline engine manufacturers to realize a gain in fuel economy of 4 to 9 percent over 1979 engines. This estimate was calculated from measured heavy-duty performance parameters and actually observed increases in light-duty vehicle fuel economy after the introduction of catalyst technology. While we expect a parallel improvement in diesel fuel economy (though probably smaller than that in gasoline engines) the magnitude is difficult to accurately determine because of the numerous combinations of adjustments, redesigns, and hardware changes that will be pursued.

X. Public Participation

The structure and content of this Final Rulemaking, which was presented in detail in the preceding portion of the Preamble, was shaped considerably by the public response to the Notice of Proposed Rulemaking (NPRM). This response took the form of a large body of oral and written comment. More than twenty organizations submitted comments on the proposal to EPA, the majority of which represented the heavy-duty engine manufacturing industry. In addition, trade organizations representing the trucking industry and the independent parts manufacturers, three governmental agencies, and two trucking companies made submissions. Finally, EPA received comments from a University of Waterloo professor and the Connecticut Construction Industries Association. We sincerely regret that no environmental, consumer, or citizens' advocacy groups of any kind were involved in the public participation process.

It is the purpose of this section of the Preamble to highlight those major areas of comment which resulted in significant alterations to the Proposed Rulemaking package as well as those which did not. The reader will be able to see from these paragraphs how the Final Rule differs from the NPRM and why EPA did not follow the suggestions of some commenters. The reader is encouraged to consult the separate document entitled "Summary and Analysis of Comments," which summarizes the comments received along with the comprehensive EPA staff analysis (see AVAILABILITY OF DOCUMENTS below). All of the detailed comments are assembled in the public docket.

A. Test Procedures

Of the components of the proposed regulations, the gasoline and diesel test procedures have probably been modified the most in response to the comments. Still, EPA has largely retained the test procedures in their proposed form (i.e., requiring transient testing).

The complications introduced by the 12-hour soak period drew a large amount of comment. We have been able to directly answer this criticism—while keeping the benefits of a cold-start procedure—by allowing a forced cool-down approach. Rather than requiring a test engine to naturally cool off for 12 hours before each test, the new provisions will allow accelerated cooling. Engine oil temperatures can be returned to ambient levels in 2–4 hours. So it will still be possible to sample cold start emissions and at the same time greatly reduce wasted dynamometer time.

In another major change from the proposed regulations, diesel engine manufacturers will be allowed to delay certification on the transient test procedure for one year, 1984. This option is offered specifically to provide interested manufacturers with enough time to explore the conversion of their eddy-current dynamometer to transient control. Caterpillar Tractor Company suggested that such a conversion might be desirable and strongly urged EPA to allow it. Certification for an additional year on the current 13-mode steady-state procedure will allow time for motoring dynamometers to still be installed if it happens that correlation cannot be established on a transient-control eddy-current dynamometer. It is important to stress, however, that we do believe that any diesel manufacturer will be able to certify for 1984 on the transient test if they proceed with replacing (rather than converting) their eddy-current machines. To be conservative, our cost analysis assumes that the manufacturers make the conversion to electric motoring dynamometers.

Finally, idle testing requirements have been removed from these regulations for diesel engines. Also the requirement for

gasoline engines has been reduced; only compliance with the CO standard is necessary.

EPA has further responded to the commenters by making numerous minor technical adjustments to both the gasoline and diesel test procedures. A thorough discussion of these points may be found in Part II of the Summary and Analysis of Comments document.

Transient testing requirements were roundly criticized by both gasoline and diesel engine manufacturers (and others). EPA's retaining of the transient test provisions in nearly their proposed form comes as a result of an extensive evaluation of the comments, in which we concluded that the proposed transient procedures are both necessary and appropriate. Comments primarily centered around the justification for the tests, their representation of real life operation, their validation, their repeatability, and the lack of current knowledge upon which to base comments.

EPA is convinced that transient testing is necessary to assure that engines will indeed demonstrate a 90 percent reduction in emissions. The current steady-state tests have been shown to become progressively less reliable as indicators of in-use emissions as stiffer standards are imposed on heavy-duty engines. Furthermore, the reductions in diesel HC emissions available through transient testing requirements are very cost effective relative to other means of HC control.

Additionally, the background of and recent experience with the transient tests support the Agency position that the tests are representative and of reasonably high quality. The origin of the operating cycles was an extensive program of actual in-use operational data collection, and we are confident that the emphasis placed on quality during the subsequent cycle development program assures real world operating characteristics are well represented in the laboratory. It will not be possible to "validate" the cycle through time-consuming comparisons between on-the-road vehicle emissions and laboratory emissions. But the pains taken to assure the representativeness of the cycles, in our view, would make such a validation superfluous anyway.

The gasoline and diesel test procedures have evolved since 1972 in an atmosphere of open intent and free sharing of information; EPA's tests data has always been readily available to manufacturers to enable them to comment and participate in the development of the procedures. The failure of some manufacturers to build up experimental test sites and hence the difficulty in commenting is largely self-imposed. On the other hand, this evolution process has been a learning experience for EPA, and we have been able to streamline the procedures to improve their quality (many minor improvements appear in the final regulations). At this stage, all labs for which transient test data are available show a degree of correlation.

The EPA analysis of the numerous comments criticizing the transient test requirements is very extensive and complete. We encourage the reader who is interested in pursuing this issue in more detail than the brief summary above to see the Summary and Analysis of Comments document.

B. Redefinition of Useful Life

The arguments of many commenters that the useful life of heavy-duty engines should not be changed from the current half-life concept were not sufficiently convincing to warrant a retraction of those provisions. On the other hand, several useful suggestions were offered and have been incorporated into the rulemaking.

Several commenters were concerned that shifting to a full-life useful life concept will violate the intent of Congress. However, EPA has been unable to find support for such a change in both the latter and the record of the Clean Air Act as amended. Nowhere does Congress place a half-life restriction on EPA with regard to heavy-duty engines.

Another issue brought up in the comments was the increased stringency of the standard as a result of the useful life revision. EPA agrees that in order to assure full-life emissions compliance the zero-mile emissions will have to be lower. Yet this really represents not an increase in the stringency of the standards so much as a necessary aspect of applying the full-life concept to certification.

EPA believes that the proposed change in the definition of useful life is appropriate and basically sound. However, we have been able to make some improvements in the application of the concept, as summarized in the following paragraphs.

Commenters were concerned that the general definition of "useful life" as the "average period of use up to engine retirement or rebuild" was not specific enough to be applied to individual engines. We agree and have linked the average period of use seen among engines in the field with a set of mechanical criteria which signal the need for a rebuild. The end of an engine's useful life (as it applies to durability testing and warranty provisions) will now be marked in one of two ways. Either the engine will reach the *average* lifetime specified for its entire engine family or tests will show that its *individual* mechanical integrity has deteriorated to the point of requiring a rebuild (whichever occurs first). The manufacturer is responsible for defining both the family-wide average useful life and the engine-specific rebuild criteria.

Another change in the regulations responds to the criticism that owners might misconstrue the meaning of the average useful life as it applies to their engine. A clarifying statement on the label will state that the actual life of the specific engine will vary according to the nature of its application. This addition should relieve manufacturers' fears that warranty conflicts will arise out of confusion among the owners about the useful life concept.

C. Revised Durability Testing Requirements

The finalizing of comprehensive in-use durability testing requirements has been postponed—even as proposed, in-use durability testing would not have to begin until 1985. This delay will allow EPA to improve upon the design of such a program in response to the broad range of comments. Further comment may be solicited and the final regulations are expected to be promulgated in the same time frame as the 1985 heavy-duty NO_x emissions rulemaking. Staff analysis of all comments will be published at that time.

D. Allowable Maintenance

Most of the comments challenged EPA's authority and justification to establish minimum "technologically necessary" maintenance intervals. At issue as well were the actual intervals that EPA proposed.

Our analysis finds adequate legal authority for EPA to make such an addition to the certification process. We were also not convinced that proper heavy-duty emission-related maintenance is widely performed; that market pressures work to improve the durability of emission-related components; and that future heavy-duty inspection and maintenance will remove the need for allowable maintenance provisions.

The comments claiming that the proposed maintenance intervals for injectors and turbochargers are improper were not based on technological arguments. Having concluded in our analysis that the concept itself of limiting maintenance is sound, we retained the proposed intervals (the technology for which

exists today). We reduced slightly the proposed spark plug change interval. Further analysis of heavy-duty catalyst technology, however, led to the retaining of the 100,000-mile interval.

The proposed requirements regarding what maintenance a manufacturer can do on durability engines have been relaxed. These regulations do not require that in-use performance of the maintenance be demonstrated. The critical maintenance item for 1984 technology is the replacement, if required, of the catalyst. However, the minimum maintenance interval of 100,000 miles is so close to the average useful life of a heavy-duty gasoline engine that our concerns that maintenance will not be performed in the field at 100,000 miles are minimal. This may not be the case with future technology. For example, when the anticipated tighter NO_x standards are implemented, three-way catalyst systems are expected to be used. Unless the oxygen sensor for such systems can be designed to last for nearly the full useful life, this issue of the "likelihood that maintenance will be performed in-use" will need to be raised again.

Several commenters challenged the demonstration of in-use performance maintenance as being unwarranted. Yet the removal of these provisions comes not so much in response to specific comments as to an Agency decision that such requirements are not necessary at the present time. We believe that the provisions being delayed today are sound and expect that the need will arise for reproposal of the requirements as control technology changes.

E. Parameter Adjustment

The primary issue brought by the commenters against the parameter adjustment regulations was that no in-use evidence exists to indicate that heavy-duty engines are maladjusted in the field. Such information is not extensive, but it does exist; inspection/maintenance data from both Oregon and New Jersey points toward significant maladjustment of heavy-duty engines. The similarity between the parameters of light-duty gasoline engines and heavy-duty gasoline engines also supports the conclusions reached regarding the maladjustment of heavy-duty engines.

We have made only slight changes to the regulations; they are in response to comments directed at the light-duty provisions, comments which have led to several technical amendments. These regulations have been adjusted to match the amended light-duty regulations.

F. Selective Enforcement Auditing

EPA had proposed a more stringent "follow-up" sampling plan for testing after suspension or revocation of a certificate of conformity. This plan imposed a greater testing burden than the proposed initial plan in order to reduce the probability that a manufacturer will pass the audit even though the true failure rate is greater than the AQL. EPA justified the increased burden of the follow-up plan on the basis of its expectation that engines are no longer in compliance, as evidenced by the initial SEA failure, and therefore the "consumer's risk" must be reduced. Several manufacturers commented that the need for this increased stringency was unjustified and would actually serve as a disincentive to bringing nonconforming engines into compliance, since, in certain cases, a manufacturer may, because of economic considerations, choose to pay nonconformance penalties rather than bring these engines into compliance. Although EPA believes that its justification for the follow-up plan is valid, the agency is concerned about any potential disincentive to the election by manufacturers to remedy nonconforming engines. Since EPA believes that the manufacturer and consumer are still adequately protected by the initial 10% AQL sampling plan, the agency has deleted all references to the follow-up sampling plans in this final rule and will retain only the initial plans, as proposed.

EPA had also proposed that the annual limit on SEA test orders for heavy-duty gasoline engines be determined by dividing the manufacturer's projected sales by 30,000. For heavy-duty diesel manufacturers, the proposed divisor was 10,000. Future sales projections for the heavy-duty engine industry indicate that sales of heavy-duty gasoline engines and heavy-duty diesels will tend to equalize during the 1984–88 period. EPA has therefore set the annual limit divisor at 30,000 for both classes of engines in the final rule, in order not to discriminate between the two classes. In addition, EPA will count test orders issued on the basis of evidence of noncompliance against this annual limit, until such time as the limit is reached.

Some other changes of a minor nature have been made in response to comments, and discussion of these changes can be found in the Summary and Analysis of Comments document (Part II: Analysis of Minor Issues).

G. Nonconformance Penalties/Production Compliance Auditing

In the February 13, 1979 proposal, EPA stated that "* * * the proposed standards are practical and achievable by all manufacturers and that consequently no technological laggards need accommodating, no upper limit need be set and the nonconformance penalty would not be available to the manufacturers." EPA has not changed its basic position after analyzing the comments. In spite of this basic position, EPA has decided to repropose the nonconformance penalties and production compliance auditing provisions at a later date. The express purpose of making this option available would be to provide relief in those rare cases when compliance may not be achieved because of some unforeseen circumstance(s). Included in this reproposal will be "upper limits" and the marginal cost component of the general formula. EPA plans on issuing a NPRM in early 1980.

H. Diesel Crankcase Emissions Control

Several commenters were concerned that closing the crankcase of turbocharged diesels would foul the turbocharger and aftercooler, hurting their efficiency. We agree that this will happen if the oily crankcase emissions are ducted directly into the turbocharger; but a turbocharger/aftercooler bypassing control system is feasible. Such a system is currently not a very cost effective means of HC, CO, NO_x, or particulate control. For this reason we are postponing—for turbocharged diesels only—crankcase control requirements until they are shown to be cost effective (This may occur soon when a current crankcase nitrosamines research program is completed.).

I. Leadtime

We were able to combine the leadtime information submitted by some of the manufacturers to arrive at a detailed timetable for the gasoline and diesel manufacturers. The timetables showed that most manufacturers would have difficulty meeting the 1983 target date. Certification for the 1984 model year, however, allows a cushion, and accordingly we have chosen to implement these regulations on January 1, 1984, one model year later than we originally proposed.

J. Feasibility

Using information supplied by the commenters, generated by the Agency, and obtained through follow-up contacts with manufacturers, EPA has been able

to conclude that each major manufacturer of gasoline and diesel heavy-duty engines will be able to meet the emissions standards for all their engines by 1984. Our analysis was carried out on an engine-by-engine basis and shows that currently available approaches to emission control will be sufficient, even when the effects of a 10 percent AQL and a full-life useful life are considered.

K. Economic Impact

Again, information from the manufacturers allowed a more accurate analysis of the proposal, in this case the associated costs. Only a few commenters itemized the individual costs of equipment, testing, self auditing, etc. But such breakdowns were immensely helpful in accurately estimating the costs which would be expected for the rest of the manufacturers. We did not agree in each instance with the projected cost of an item, but a basis was provided for analysis. Of course, for the manufacturers which offered no cost estimates or breakdowns, the staff was obliged to make the estimates.

It is useful to describe the reasons why the aggregate cost has changed significantly from the NPRM. Primarily, a more accurate calculation of the costs due the use of unleaded fuel has resulted in a lower total cost. Three aspects of the analysis were improved: (1) we reduced the cost differential between leaded and unleaded gasoline from 5 cents/gallon to 3 cents/gallon (See the Regulatory Analysis); (2) a more accurate average useful life value for heavy-duty gasoline engines was used; and (3) we substituted a more realistic average vehicle fuel economy value.

On the other hand, the projected individual engine costs are greater now than in the proposal. This increase, primarily due to hardware costs, results largely from the improved analysis made possible by the comments.

ANTICOMPETITIVE EFFECTS: EPA does not anticipate that this regulation will result in any significant anticompetitive effects. Among the domestic engine manufacturers, the first price increases of their engines will be very similar. Some foreign manufacturers will need slightly larger increases because of their low U.S. sales, but even for them the price increases are not a large fraction of the new vehicle cost. Finally, independent parts manufacturers should not be adversely affected; their portion of the aftermarket parts market is not expected to decrease.

ADMINISTRATIVE DESIGNATION AND REGULATORY ANALYSIS: The Administrator has determined that this action is a "significant" regulation. We have prepared a comprehensive document entitled "Gaseous Emission Regulations for 1983 and Later Model Year Heavy-Duty Engines: Regulatory Analysis" to support the rulemaking and fulfill the requirements of Executive Order 12044 and Section 317 of the amended Clean Air Act. Anyone may review and reproduce this document in the EPA Central Docket Section (See "AVAILABILITY OF DOCUMENTS" below).

AVAILABILITY OF DOCUMENTS AND THE PUBLIC DOCKET: Materials relevant to this rulemaking have been assembled in Public Docket No. OMSAPC–78–4, U.S. Environmental Protection Agency, Central Docket Section, Room 2903B (EPA Library), Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460. Such materials as regulatory support documents, comments, hearing transcripts, correspondence, the Summary and Analysis of Comments, and the Regulatory Analysis may be obtained by anyone from the docket. As provided in 40 CFR Part 2, the Agency may charge a reasonable fee for copying services. Additionally, single copies of the Summary and Analysis of Comments and the Regulatory Analysis are available from the Director, Emission Control Technology Division, 2565 Plymouth Road, Ann Arbor, MI 48105.

EVALUATION PLAN: EPA intends to review the effectiveness and need for continuation of the provisions contained in this action no more than five years after initial implementation of the final regulation. In particular, EPA will solicit comments from affected parties with regard to cost and other burdens associated with compliance and will also review data on the gaseous emissions from heavy-duty vehicles built before and after implementation of the regulations to determine how effective this measure has been.

REPORTING AND RECORDKEEPING REQUIREMENTS: This rulemaking will not impose significant additional reporting requirements or keeping of records. The SEA regulations do increase reporting requirements somewhat, but not greatly. Conversely, the requirements of the current durability testing will be removed.

Under EPA's recently established "sunset" policy, the reporting requirements of a regulation normally expire after five years unless action is taken to extend them. However, the leadtime required for these regulations will allow for only one year of actual implementation. Also, within the next five years the Agency will undertake a review of *all* of the reporting requirements associated with mobile source emission regulation, including those of this package. An additional review of the new reporting requirements of these regulations may not be necessary or useful.

Nevertheless, the need for future review cannot be determined at this time. Therefore, we establish in these regulations provisions for the automatic expiration of these requirements. But because of the four-year leadtime associated with these regulations, the five-year period will begin not at promulgation but at implementation (January 1, 1984). Thus, if the Agency does not establish the need for continuation, the new reporting and recordkeeping requirements of this rulemaking will expire after the 1988 model year.

Dated: December 21, 1979.

Douglas M. Costle,

Administrator.

Part 86 of Chapter I, Title 40 of the Code of Federal Regulations is proposed to be amended as follows:

Note.—This Final Rulemaking concerns only provisions of Part 86 applicable to heavy-duty engines. Certain of the amendments listed here, if read literally, might indicate that provisions currently in effect for light-duty trucks are to be retained. This is not the case. Another independent Notice of Proposed Rulemaking concerning only provisions of Part 86 applicable to light-duty trucks has been published at 44 FR 40784, July 12, 1979. Interested persons should consult that Notice regarding the light-duty truck amendments proposed to take effect January 1, 1983.

1. Paragraph (a) of § 86.077–2 is revised to read as follows:

§ 86.077–2 Definitions.

(a) The definitions in this section apply to this subpart and also to Subparts B, D, H, I, J, N, O, and P of this part.

* * * * *

2. Paragraph (a) of § 86.078–3 is revised to read as follows:

§ 86.078–3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, D, H, I, J, N, O and P of this part and have the following meanings:

* * * * *

2a. The following sections are added to the table of contents under Subpart A:

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks, and for 1977 and Later Model Year New Heavy-Duty Engines

* * * * *

Sec.

3. A new § 86.084–2 is added and reads as follows:

§ 86.084–2 Definitions.

The following definitions apply beginning with the 1984 model year. Section 86.080–2 remains effective excepting those definitions which are hereby superseded.

A "maximum torque curve" is a plot of maximum engine torque versus engine speed, also known as an "engine map."

The "measured rated rpm" is the highest engine speed at which the maximum horsepower occurs as derived from the maximum torque curve, or an engine speed specified by the manufacturer. This specified rated speed must be more than 100 rpm higher than the highest engine speed at which maximum horsepower is observed to occur and the horsepower observed at this specified speed must be at least 50 percent of the maximum observed during the engine map.

The "high idle speed" for a diesel engine means the governed speed at no load.

"Curb idle transmission torque" is the torque observed at the flywheel of a heavy-duty engine coupled with an automatic transmission, with the engine running at the manufacturer's specified curb idle speed, the transmission in gear, and the output shaft stalled.

"Integrated brake horsepower" is the total work done by an engine during a transient test, calculated by the incremental summing of brake horsepower-hour segments.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction, or anticipated as necessary to correct an overt indication of vehicle malfunction or failure for which periodic maintenance is not appropriate.

"Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction which was not anticipated.

"Useful life" means:

(a) For light-duty vehicles and light-duty trucks a period of use of 5 years or 50,000 miles, whichever first occurs.

(b)(1) For a heavy-duty engine family, the average period of use up to engine retirement or rebuild, whichever occurs first, as determined by the manufacturer under Section 86.084–21(b)(4)(ii)(B).

(2) For a specific heavy-duty engine, the period of use represented by the first occurring of the following:

(i) The engine reaches the point of needing to be rebuilt, according to the criteria established by the manufacturer under § 86.084–21(b)(4)(ii)(C), or

(ii) The engine reaches its engine family's useful life.

(3) If the useful life of a specific heavy-duty engine is found to be less than 5 years or 50,000 miles (or the equivalent), the useful life shall be a period of use of 5 years or 50,000 miles (or the equivalent), whichever occurs first, as required by section 202(d)(2) of the Act.

"Non-emission related maintenance" means that maintenance which does not substantially affect emissions or which does not have a lasting effect on the deterioration of the vehicle or engine with respect to emissions once the maintenance is performed at any particular date.

"Emission-related maintenance" means that maintenance which does substantially affect emissions or which is likely to have a lasting effect on the deterioration of the vehicle or engine with respect to emissions, even if the maintenance is performed at some time other than that which is recommended.

4. A new 86.084–4 is added and reads as follows:

§ 86.084–4 Section numbering; construction.

(a)(1) *Section numbering.* (1) The model year of initial applicability is indicated by the last two digits of the 5-digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hypen designates what previous section is replaced by a future regulation.

Examples: Section 86.077–6 applies to the 1977 and subsequent model years until superseded. If a § 86.080–6 is promulgated it would take effect with the 1980 model year; § 86.077–6 would not apply after the 1979 model year. Section 86.077–10 would be replaced by § 86.078–10 beginning with the 1978 model year.

(2) Where a section still in effect references a section that has been superseded, the reference shall be interpreted to mean the superseding section.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

5. A new 86.084–5 is added and reads as follows:

§ 86.084–5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced, or delivered for introduction to commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§86.081–21, 86.081–22, 86.079–23, and §§ 86.079–29 through 86.079–34.

(2) No heavy-duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any gasoline-fueled or Diesel heavy-duty vehicle which uses an engine which has not been certified as meeting applicable standards. Each heavy-duty vehicle manufacturer shall provide to the Administrator prior to the beginning of each model year a statement signed by

an authorized representative which includes the following information:

(i) A description of the vehicles which will be produced subject to this section;

(ii) Identification of the engines used in the vehicles;

(iii) Projected sales data on each vehicle-engine combination;

(iv) A statement that the engines will not be modified by the vehicle manufacturer or a detailed specification of any changes which will be made. Changes made solely for the purpose of mounting an engine in a vehicle need not be included.

(v) A statement that the engine maintenance instruction supplied by the engine manufacturer, in compliance with § 86.079–38, will be furnished to the ultimate purchaser. If these maintenance instructions are modified, a detailed description of the modifications and a justification for each must be provided to the Administrator for review. The Administrator will notify the manufacturer of the determination whether the modified instructions are reasonable and necessary to assure proper functioning of the emission control system.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart

(i) Shall not in its operation or function cause the emission into the ambient air or any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) In establishing the physically adjustable range of each adjustable parameter on a new motor vehicle (or new motor vehicle engine), the manufacturer shall ensure that, taking into consideration the production tolerances, safe vehicle driveability characteristics are available within that range, as required by section 202(a)(4) of the Clean Air Act.

(3) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

6. A new § 86.084–10 is added and reads as follows:

§ 86.084–10 Emission standards for 1984 and later model year gasoline-fueled heavy-duty engines.

(a)(1) Exhaust emissions from new 1984 and later model year gasoline-fueled heavy-duty engines shall not exceed the following:

(i) *Hydrocarbons.* 1.3 grams per brake horsepower hour, as measured under transient operating conditions.

(ii) *Carbon monoxide.* (a) 15.5 grams per brake horsepower hour, as measured under transient operating conditions.

(B) 0.47 percent of the exhaust gas flow at curb idle.

(iii) *Oxides of nitrogen.* 10.7 grams per brake horsepower hour, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over operating schedules set forth in Subparts N or P and measured and calculated in accordance with those procedures.

(b) [Reserved]

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1984 model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subparts N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

7. A new § 86.084–11 is added and reads as follows:

§ 86.084–11 Emission standards for 1984 diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1984 model year diesel heavy-duty engines shall not exceed the following:

(i) *Hydrocarbons.* (A) 1.3 grams per brake horsepower hour, as measured under transient operating conditions (Subpart N), or

(B) 0.5 grams per brake horsepower hour, as measured under steady-state operating conditions (Subpart D).

(ii) *Carbon monoxide.* (A) 15.5 grams per brake horsepower hour, as measured under either transient operating conditions (Subpart N) or under steady-state operating conditions (Subpart D).

(iii) *Oxides of nitrogen.* (A) 10.7 grams per brake horsepower hour, as measured under transient operating conditions (Subpart N) or

(B) 9.0 grams per brake horsepower-hour as measured steady-state operating conditions (Subpart D).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust over operating schedules as set forth in Subparts N, D, or P and measured and calculated in accordance with those procedures.

(b)(1) The opacity of smoke emissions from new 1984 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to the exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1984 model year naturally-aspirated diesel heavy-duty engine. This provision does not apply to turbocharged engines.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subparts I, N, D, or P of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b) and (c) of this section.

8. A new § 86.084–21 is added and reads as follows:

§ 86.084–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the preliminary application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters to which access is difficult); which are present on any device, system or assembly described in the application; and which may affect emissions.

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the preliminary application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameters will be subject to adjustment for certification and Selective Enforcement Audit (and Production Compliance Audit for heavy-duty engines) and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) A description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.084–23(b)(2).

(ii)(A) A description of the test procedures to be used to establish the exhaust emission deterioration factors for heavy-duty engines required to be determined and supplied in § 86.084–23(1)(ii).

(B)(*1*) A statement of the useful life of each heavy-duty engine family up to engine retirement or rebuild (whichever occurs first) as determined by the manufacturer on the basis of the following:

(*i*) For existing engine families, survey information on in-service engines or

(*ii*) For new engine families, durability testing of prototype engines or a combination of bench-type component life evaluations and survey information on similar previous engines.

(*2*) The manufacturer shall not determine an engine family's useful life to be less than the basic period of the mechanical warranty on the engine assembly. This useful life shall be expressed as a period of engine or vehicle operation or as an equivalent vehicle mileage (or both) and shall be consistent with the rebuild criteria specified in paragraph (b)(4)(ii)(C) of this paragraph. The manufacturer shall include in the application the data or information on which it based its determination of the useful life.

(C) For each heavy-duty engine family, a statement of the criteria which are to be used in determining the need for engine rebuild and their critical values, including the following:

(*1*) The minimum cylinder compression for any one cylinder and for any two cylinders, in pounds per square inch. Compression shall be measured without the addition of oil or another fluid into the cylinder.

(*2*) The maximum rate of engine lubricant oil usage by the engine, in quarts per 1,000 miles (or quarts per 30 hours).

(*3*) The maximum mass of foreign metal in the crankcase, in grams per quart of crankcase oil.

(*4*) Any other measurable indicator(s) of engine condition approved by the Administrator and the critical value(s) which signal(s) the need for a rebuild.

(*5*) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*6*) At the option of the manufacturer, the proposed composition of the emission-data or durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.079–32, 86.079–33, and 86.079–34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

9. A new § 86.084–22 is added and reads as follows:

§ 86.084–22 Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit and Production Compliance Audit, adequacy of limits, and physically adjustable ranges.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.080–24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(d)(1) The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors. The manufacturer shall submit the procedures as required in § 86.084–21(b)(4)(i) prior to the Administrator's selection of the test fleet under § 86.084–24(b)(1) and if such procedures will involve testing of durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.084–24(c)(1), prior to initiation of such testing.

(2) The Administrator does not approve the test procedures for establishing exhaust emission deterioration factors for heavy-duty

engines, the manufacturer's determination of the useful life of its heavy-duty engines, nor the manufacturer's determination of the values of the rebuild criteria. The manufacturer shall submit these procedures and determinations as required in § 86.084–21(b)(4)(ii) prior to the initiation of durability testing.

(e) When the Administrator selects emission-data vehicles (engines) for the test fleet, he will at the same time determine those vehicle or engine parameters which will be subject to adjustment for certification, Selective Enforcement Audit and Production Compliance Audit testing, the adequacy of the limits, stops, seals, or other means used to inhibit adjustment, and the resulting physically adjustable ranges for each such parameter and notify the manufacturer of his determinations.

(1)(i) The Administrator may determine to be subject to adjustment the idle fuel-air mixture, idle speed, and initial spark timing parameters on gasoline-fueled vehicles (engines) (carbureted or fuel injected); the choke valve action parameter(s) on carbureted, gasoline-fueled vehicles (engines); or any parameter on any vehicle (engine) (diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on the manufacturer's vehicles (engines) in the previous model year in the same form and function.

(ii) The Administrator may, in addition, determine to be subject to adjustment any other parameters on any vehicle or engine which is physically capable of being adjusted and which may significantly affect emissions. However, the Administrator may do so only if he has previously notified the manufacturer that he might do so and has found, at the time he gave this notice, that the intervening period would be adequate to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. In no event will this notification be given later than September 1 of the calendar year two years prior to the model year.

(iii) In determining the parameters subject to adjustment the Administrator will consider the likelihood that, for each of the parameters listed in paragraphs (e)(1)(i) and (e)(1)(ii) of this section, settings other than the manufacturer's recommended setting will occur on in-use vehicles (engines). In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application, surveillance information from similar in-use vehicles (engines), the difficulty and cost of gaining access to an adjustment, damage to the vehicle (engine) if an attempt is made to gain such access and the need to replace parts following such attempt, and the effect of settings other than the manufacturer's recommended setting on vehicle (engine) performance characteristics including emission characteristics.

(2)(i) The Administrator shall determine a parameter to be adequately inaccessible or sealed if:

(A) In the case of an idle mixture screw, the screw is recessed within the carburetor casting and sealed with lead, thermosetting plastic, or an inverted elliptical spacer or sheared off after adjustment at the factory, and the inaccessibility is such that the screw cannot be accessed and/or adjusted with simple tools in one-half hour.

(B) In the case of a choke bimetal spring, the plate covering the bimetal spring is riveted or welded in place, or held in place with nonreversible screws.

(C) In the case of a parameter which may be adjusted elongating or bending adjustable members (e.g., the choke vacum break), the elongation of the adjustable member is limited by design or, in the case of a bendable member, the member is constructed of a material which when bent would return to its original shape after the force is removed (plastic or spring steel materials).

(D) In the case of any parameter, the manufacturer demonstrates that adjusting the parameter, to settings other than the manufacturer's recommended setting takes more than one-half hour or costs more than $20 (1978 dollars).

(ii) The Administrator shall determine a physical limit or stop to be an adequate restraint on adjustability if:

(A) In the case of a threaded adjustment, the threads are terminated, pinned or crimped so as to prevent additional travel without breakage or need for costly repairs.

(B) The adjustment is ineffective at the end of the limits of travel regardless of additional forces or torques applied to the adjustment.

(C) The manufacturer demonstrates that travel or rotation limits cannot be exceeded with the use of simple and inexpensive tools (screwdriver, pliers, open-end or box wrenches, etc.) without incurring significant and costly damage to the vehicle (engine) or control system or without taking more than one-half hour or costing more than $20 (1978 dollars).

(iii) If manufacturer service manuals or bulletins describe routine procedures for gaining access to a parameter or for removing or exceeding a physical limit, stop, seal or other means used to inhibit adjustment, or if surveillance data indicate that gaining access, removing, or exceeding is likely, paragraphs (e)(2)(i) and (e)(2)(ii) of this section shall not apply for that parameter.

(iv) In determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of a parameter not covered by paragraph (e)(2)(i) or (e)(2)(ii) of this section, the Administrator will consider the likelihood that it will be circumvented, removed, or exceeded on in-use vehicles. In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application; surveillance information from similar in-use vehicles (engines); the difficulty and cost of circumventing, removing, or exceeding the limit, stop, seal, or other means; damage to the vehicle (engine) if an attempt is made to circumvent, remove, or exceed it and the need to replace parts following such attempt; and the effect of settings beyond the limit, stop, seal, or other means on vehicle (engine) performance characteristics other than emission characteristics.

(3) The Administrator shall determine two physically adjustable ranges for each parameter subject to adjustment:

(i)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator may include within the physically adjustable range applicable to testing under this subpart (certification testing) all settings within the production tolerance associated with the nominal setting for that parameter, as specified by the manufacturer in the preliminary application for certification.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability. The Administrator may also include the production tolerances on the location of these limits or stops when determining the physically adjustable range.

(ii)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator shall include within the physically adjustable range applicable to testing under Subpart G or K (Selective Enforcement Audit and Production Compliance Audit for heavy-duty engines) only the actual settings to which the parameter is adjusted during production.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical

limits or stops determined to be adequate restraints on adjustability, as they are actually located on the test vehicle (engine).

(f)(1) If the manufacturer submits the information specified in § 86.084–21(b)(1)(ii) in advance of its full preliminary application for certification, the Administrator shall review the information and make the determinations required in paragraph (e) of this section within 90 days of the manufacturer's submittal.

(2) The 90-day decision period is exclusive of the elapsed time during which EPA may request additional information from manufacturers regarding an adjustable parameter and the receipt of the manufacturers' response(s).

(g) Within 30 days following receipt of notification of the Administrator's determinations made under paragraph (e) of this section, the manufacturer may request a hearing on the Administrator's determinations. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

10. A new § 86.084–23 is added and reads as follows:

§ 86.084–23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test precedures, and submit to the Administrator the following information: *Provided, however,* That:

(1) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) for which emission data are available, or will be made available, under the provisions of § 86.079–29, or

(2) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles at zero kilometers of operation.

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles and light-duty trucks tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for heavy-duty engines and all test data that are derived from the testing described under § 86.084–21(b)(4)(ii)(A) as well as a record of all pertinent maintenance. Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.084–30 will meet the emission standards in § 86.084–10 or § 86.084–11, as appropriate, in actual use for the useful life of the engine.

(2) Evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.084–21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.079–30 will meet the evaporative emission standards in § 86.081–8 or § 86.081–9, as appropriate, for the useful life of the vehicle.

(c) *Emission data.*—(1) *Certification vehicles.* (i) Emission data on such vehicles tested in accordance with the applicable test procedures and in such numbers as specified, which will show their emissions after zero kilometers (zero miles) and 6,436 kilometers (4,000 miles) operation.

(ii) Emission data on those vehicles selected under § 86.079–24(b)(1)(v) and § 86.079–24(b)(1)(vii)(D) and tested in accordance with the applicable test procedures of this subpart and in such numbers as therein specified, which shall be tested at zero kilometers (zero miles) at any altitude, and under high-altitude conditions after 6,436 kilometers (4,000 miles) of operation at any altitude.

(2) *Certification engines.* Emission data on such engines tested in accordance with applicable emission test procedures and in such numbers as specified, which will show their emissions after 125 hours of operation. A zero-hour test may be performed after the engine has been approved by the Administrator to begin service accumulation.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.078–5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.078–5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with §§ 86.078–8, 86.079–9, 86.079–10, 86.079–11, 86.080–10, or 86.080–11, as applicable, are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicle (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards. The provisions of § 86.079–30(b) shall then be followed.

(2) For evaporative emission durability and heavy-duty engine exhaust emission durability, the statement of compliance with paragraph (b)(1) or (b)(2) of this section.

11. A new § 86.084–24 added and reads as follows:

§ 86.084–24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90°, V–8, etc.).

(v) The location of the intake and exhaust valves (or ports) and the valve (or port) sizes (within a ⅛-inch range on the valve head diameter or within 10 percent on the port area.)

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (e.g., intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size and configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics.

(5) The gasoline-fueled vehicles covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) To be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (e.g., canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(b) *Emission data.*—(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Vehicles for each engine family will be divided into engine displacement-exhaust emission control system combinations as applicable. A projected sales volume will be established for each combination for the model year for which certification is sought. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination may be selected. The vehicle selected for each combination will be specified by the Administrator as to such features as engine code, transmission type, fuel system, and inertia weight class.

(iii) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options, and axle ratio.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (ii) and (iii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to such features as engine code, transmission type, fuel system, and inertia weight class.

(v) Within an engine family the Administrator may select one additional vehicle for each engine-system combination with which a manufacturer chooses to demonstrate compliance with applicable emission standards at high altitude.

(vi) The Administrator may combine testing requirements for any vehicle selected under paragraph (b)(1)(v) or (b)(1)(vii)(D) of this section with the testing requirements for any similar vehicle in the same engine-system combination selected under paragraph (b)(1) (ii), (iii) or (iv) of this section or any similar vehicle in the same engine-system, evaporative emission family, evaporative emission control system combination selected under paragraph (b)(1)(vii) (A) or (B) of this section. The testing requirements may be combined by the Administrator by requiring a vehicle selected for testing under paragraphs (b)(1) (ii), (iii), (iv), (vii)(A) or (vii)(B) of this section to be modifed (if necessary) after mileage accumulation and emission testing for the purpose of demonstrating compliance with § 86.078–23 (c)(1)(ii).

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems. One vehicle of each evaporative emission control system within the evaporative emission family will be selected.

(B) The Administrator may select a maximum of four additional vehicles within each evaporative emission family based upon features indicating that they may have the highest evaporative emission levels of vehicles in that family.

(C) The Administrator may determine that the vehicles selected under paragraphs (b)(1) (ii) through (iv) of this section may be used to satisfy the requirements of paragraph (b)(1)(vii) (A) and (B) of this section.

(D) The Administrator may also select one additional vehicle for each evaporative emission control system within each evaporative family for those vehicles with which the manufacturer chooses to demonstrate compliance with applicable emission standards at high altitude.

(E) Vehicles selected under paragraph (b)(1)(v) of this section may be used to satisfy the requirements of paragraph (b)(1)(vii)(D) of this section.

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline-fueled heavy-duty engines.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into engine displacement-exhaust emission control system combinations. A projected sales volume

will be established for each combination for the applicable model year. One engine of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of engines of that family is represented, or until a maximum of four engines is selected. The engines selected for each combination will be specified by the Administrator as to fuel system.

(iii) The Administrator may select a maximum of two additional engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in that engine family. In selecting these engines, the Administrator will consider such features as the exhaust emission control system, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, and compression ratio.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine system combination shall be run for smoke emission data and gaseous emission data. Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(c) *Durability data.*—(1) *Durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle and light-duty truck durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(2) *Heavy-duty durability-data engines.* Paragraph (c)(2) of this section applies to engines, subsystems, or components used to establish deterioration factors for heavy-duty engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use engines, based on good engineering judgment.

(ii) [Reserved]

(d) For purposes of testing under § 86.078–26 (a)(9), (b)(9) or (c)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (or durability-data engines) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section: *Provided,* That the number of vehicles selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle, whichever is greater.

(e) Any manufacturer whose projected sales for the model year in which certification is sought is less than

(1) 2,000 gasoline-fueled light-duty vehicles, or

(2) 2,000 Diesel light-duty vehicles, or

(3) 2,000 gasoline-fueled light-duty trucks, or

(4) 2,000 Diesel light-duty trucks, or

(5) 2,000 gasoline-fueled heavy-duty engines, or

(6) 2,000 Diesel heavy-duty engines, may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedures.

(f) In lieu of testing an emission-data or durability data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.084–23 has previously been submitted.

(g)(1) This paragraph applies to light-duty vehicles and light-duty trucks.

(2) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with an optional item, the full estimated weight of that item shall be included, if required by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicles in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission-data and durability-data vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be

expected to influence emissions are the air conditioner, power steering, power brakes and other items determined by the Administrator.

(4) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

12. A new § 86.084–25 is added and reads as follows:

§ 86.084–25 Maintenance.

(a) *Light-duty vehicles and light-duty trucks.* Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(1) Scheduled maintenance on the engine, emission control system, and fuel system of durability-data vehicles, selected by the Administrator or elected by the manufacturer under § 86.079–24(c)(1), shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed, except as provided in paragraph (a)(5)(iii) of this section, only under the following provisions:

(i) Schedules major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving: *Provided,* That no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a)(1)(i) (A) or (B) of this section, and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel.

(A) *For gasoline-fueled vehicles,* the following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(B) *For Diesel vehicles,* a major engine tuneup shall be restricted to the following:

(*1*) Adjust low idle speed.

(*2*) Adjust valve lash if required.

(*3*) Adjust injector timing.

(*4*) Adjust governor.

(*5*) Clean and service injector tips.

(*6*) Adjust drive belt tension on engine accessories.

(*7*) Check engine bolt torque and tighten as required.

(ii) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to adjustment during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(2)(i) *For gasoline-fueled vehicles,* unscheduled maintenance on the engine, emission control system, and fuel system of durability vehicles may be performed, except as provided in paragraph (a)(5)(i) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle-speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(ii) *For Diesel vehicles,* unscheduled maintenance on the engine emission control system, and fuel system of durability-data vehicles may be performed except as provided in paragraph (a)(5)(i) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(3) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(i) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance at each of those mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(ii) Manufacturers may service the EGR system as unscheduled maintenance a maximum of three times during the 50,000 miles if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iii) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tuneup point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iv) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(4) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data vehicles shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(A) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(B) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, vehicle stalling, overheating, fluid leakage, loss of oil pressure, or charge indicator warning. For the evaporative emission control system this overt indication may be indicated by such items as fuel odor or fluid leakage.

(ii) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i)(A) of this section.

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturers makes a satisfactory showing that the maintenance will be performed on vehicles in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability-data vehicle.

(7) Where the Administrator agrees under § 86.079–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(8)(i) Adjustment of engine idle speed on emission-data vehicles may be performed once before the 6,436-kilometer (4,000-mile) test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission-data vehicles shall be performed only with the advance approval of the Administrator.

(ii) Maintenance on emission-data vehicles selected under § 86.079–24 (b)(1)(v) or (b)(1)(vii)(D) and permitted to be tested for purposes of § 86.079–23 (b)(1)(ii) under the provisions of § 86.079–24 (b)(1)(vi) may be performed in conjunction with emission control system modifications at the 6,436-kilometer (4,000-mile) test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.079–38.

(iii) Maintenance on those emission-data vehicles selected under § 86.079–24 (b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than intended by the original design may be performed in conjunction with the emission control system modifications at the 6,436-kilometer (4,000-mile) test point, and shall be approved in advance by the Administrator.

(9) Repairs to vehicle components of the durability-data or emission-data vehicle, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(10) Complete emission tests (see §§ 86.106 through 86.145) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days), after the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within 10 working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 86.079–23.

(11) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle malfunction (e.g., misfiring, stalling, black smoke), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(12) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components,

(ii) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a)(5)(i) of this section for durability-data vehicles or paragraph (a)(8)(i) of this section for emission-data vehicles, or

(iii) Unless specifically authorized by the Administrator.

(b) [Reserved]

(c) *Heavy-duty engines.* Paragraph (c) of this section applies to heavy-duty engines.

(1) All emission-related scheduled maintenance which is necessary for compliance with the standards in actual use must be technologically necessary. The emission-related maintenance which is performed on engines, subsystems, or components used to determine exhaust emission deterioration factors must be compatible with the requirements of the previous sentence.

(i) The manufacturer must submit data to the Administrator which demonstrates that all of the emission-related maintenance which is to be performed on the engines is technologically necessary. EPA has determined that emissions-related maintenance at shorter intervals than that outlined in paragraphs (c)(1)(ii) and (c)(1)(iii) is not technologically necessary. The Administrator may determine that even maintenance more restrictive (e.g., longer intervals) than that listed in paragraphs (c)(1)(ii) and (c)(1)(iii) is not technologically necessary.

(ii) For gasoline-fueled engines, emission-related maintenance in addition to, or at shorter intervals, than that listed below will not be accepted as technologically necessary, except as provided in paragraph (c)(1)(iv).

(A) The cleaning or replacement of spark plugs at 25,000 miles and at 25,000-mile intervals thereafter.

(B) The inspecting, cleaning, adjustment, or replacement of the following at 50,000 miles of use and at 50,000-mile intervals thereafter:

(*1*) Postive crankcase ventilation and exhaust gas recirculation valves:

(*2*) Emission-related hose and tubes;

(3) Ignition wires;
(4) Oxygen sensor;
(5) Injector tips (inspecting and cleaning only);
(6) Idle mixture.
(C) The replacement of the catalytic converter at 100,000 miles of use and at 100,000-mile (or longer) intervals thereafter.
(iii) For diesel engines, emission-related maintenance in addition to or at shorter intervals than that listed below will not be accepted as technologically necessary, except as provided in paragraph (c)(1)(iv).
(A) The following maintenance at 50,000 miles of use and at 50,000-mile intervals thereafter.
(1) Cleaning or replacement of the exhaust gas recirculation and positive crankcase ventilation valves;
(2) Cleaning of injector tips.
(B) The cleaning, rebuilding, or replacement of the following at 200,000 miles of use and at 200,000 mile intervals thereafter:
(1) Turbocharger;
(2) Injectors.
(iv) Requests for authorization of scheduled maintenance of emission control related components in addition to those items of maintenance covered under paragraphs (c)(1)(ii) and (c)(1)(iii) will be considered if the maintenance is a direct result of the implementation of new technology. New technology means any technology not found in production on any motor vehicle prior to the 1980 model year.
(v) [Reserved]
(vi) Non-emission related engine maintenance which is reasonable and necessary (e.g., oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, accessory belt inspection, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data engines at the intervals recommended by the manufacturer to the utlitmate purchaser.
(vii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (c)(1)(viii)(A) of this section, only under the following provisions:
(A) An injector or spark plug may be changed if a persistent misfire is detected.
(B) Readjustment of a gasoline-fueled engine cold-start enrichment system may be performed if there is a problem of stalling.
(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, if there is a problem of stalling.
(viii) Any other unscheduled engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.
(A) Such approval will be given if the Administrator:
(1) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,
(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.
(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (c)(1)(vii) of this section.
(ix) If the Administrator determines the part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not continue to be used as a durability-data engine. The emission data from an engine that is discontinued as a durability-data engine shall not be included in the evaluation of the deterioration factor for the family-system combination if its calculated deterioration factor is less than the average deterioration factor for the remaining durability-data engines in the combination, unless the manufacturer's engineering analysis demonstrates, to the satisfaction of the Administrator, that the data is representative.
(2) [Reserved]
(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications.
(ii) Any other engine, emission control system, or fuel system, adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.
(4) [Reserved]
(5)(i) [Reserved]
(ii) [Reserved]
(iii) [Reserved]
(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days), along with a complete record of all pertinent maintenance.
(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 72 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within 10 working days after the completion of the emissions tests. The Administrator may approve an extension of the time requirements for the final engineering report.
(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.079–23.
(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling.)
(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets, and:
(i) Are used in conjunction with scheduled maintenance on such components;
(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (c)(2)(v)(A) of this section for durability-data engines or paragraph (c)(3) of this section for emission-data engines; or
(iii) Unless specifically authorized by the Administrator.
13. A new § 86.084–26 is added and reads as follows:

§ 86.084–26 Mileage and service accumulation; emission measurements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.
(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.125, the

manufacturer may elect to conduct the respective emission tests at higher loaded vehicle weight. Mileage will be accumulated on four wheel drive vehicles in their normal on-highway mode of operation.

(3) *Emission-data vehicles.*—(i) *Gasoline-fueled.* (A) Each gasoline-fueled emission-data vehicle shall be driven 4000 miles with all emission control systems installed and operating. Complete exhaust emission tests shall be conducted at zero miles and 4000 miles on those vehicles selected under § 86.079–24 (b)(1)(ii) through (b)(1)(v). Complete exhaust and evaporative emission tests shall be conducted at zero miles and 4000 miles on those vehicles selected under § 86.079–24(b)(1)(vii). The manufacturer may at his option test the vehicles selected under § 86.079–29(b)(1)(vii) up to three times at the 4000-mile test point as long as the ±250 mile test tolerance is adhered to. The Administrator may determine under § 86.079–24(f) that no testing is required.

(B) The emission-data vehicle(s) selected for testing under § 86.079–24 (b)(1)(v) or (b)(1)(vii)(D) shall be driven 6,436 kilometers (4,000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6,436 kilometers (4,000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.079–24 (b)(1)(v) or (b)(1)(vii)(D) and permitted to be tested for purposes of § 86.079–23(b)(1)(ii) under the provisions of § 86.079–24(b)(1)(vi) shall be driven 6,436 kilometers (4,000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6,436 kilometers (4,000 miles) under both low- and high-altitude conditions. For the purposes of this subparagraph, "low altitude" means any elevation less than 549 meters (1,800 feet).

(ii) *Diesel.* (A) Each Diesel emission-data vehicle shall be driven 6,436 kilometers (4,000 miles) with all emission control systems installed and operating. Emission tests shall be conducted at zero kilometers (zero miles) and 6,436 kilometers (4,000 miles).

(B) The emission-data vehicle(s) selected for testing under § 86.079–24(b)(1)(v) shall be driven 6,436 kilometers (4,000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6,436 kilometers (4,000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.079–24(b)(1)(v) and permitted to be tested for purposes of § 86.079–23(b)(1)(ii) under the provisions of § 86.079–24(b)(1)(vi) shall be driven 6,436 kilometers (4,000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6,436 kilometers (4,000 miles) under both low- and high-altitude conditions. For the purpose of this subparagraph "low altitude" means any elevation less than 549 meters (1,800 feet).

(4) *Durability-data vehicles.*—(i) *Gasoline-fueled.* Each gasoline-fueled durability-data vehicle selected by the Administrator or elected by the manufacturer under § 86.079–24(c)(1) shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission tests shall be made on all durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.079–24(c) at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; 50,000. The Administrator may determine under § 86.079–24(f) that no testing is required.

(ii) *Diesel.* Each Diesel durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of the procedure. Complete emission tests (see §§ 86.106 through 86.145) shall be made at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; and 50,000.

(5) All tests required by this subpart to be conducted after every 5,000 miles of driving for durability-data vehicles and 4,000 miles for emission-data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(6)(i) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within 3 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.070–23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used on the calculation of the deterioration factor.

(ii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E29–67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standards of this subpart to three significant figures.

(7) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero-mile test data to the Administrator and make the vehicle available for such testing under § 86.079–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(8) Once a manufacturer begins to operate an emission-data or durability-data vehicle, as indicated by compliance with paragraph (a)(7) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 86.079–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other

than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.079–23(b)(2).

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) There are two types of service accumulation applicable to heavy-duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.084–24(c)(2)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.084–24(b)(2) or § 86.084–24(b)(3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) Each emission-data engine shall be operated on a dynamometer for 125 hours plus or minus eight hours with all emission control systems installed and operating. An emission test shall be conducted at the end of this dynamometer service accumulation. A zero-hour emission test may be performed after the engine has been approved by the Administrator to begin service accumulation. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system. If a break-in procedure is used the procedure must be the same as recommended to the ultimate purchaser. The hours accumulated during the break-in procedure will not be counted as part of the service accumulation.

(5) [Reserved]

(6) [Reserved]

(7) [Reserved]

(8) [Reserved]

(9)(i) Data from all emission tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. The Administrator may require emission tests at points in addition to those specified in this subpart. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.084–23.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E29–67.

(10) Whenever the manufacturer proposes to operate and test an engine which may be used for emission data, it shall provide such information concerning components used on the engine as the Administrator may require and make the engine available for such testing under § 86.084–29 as the Administrator may require, before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data submitted for this engine.

(11) Once the manufacturer begins to operate an emission-data engine, as indicated by compliance with paragraph (b)(10) of this section, it shall continue to run that engine to 125 hours plus or minus eight hours.

(12) [Reserved]

(13) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(14) A new § 86.084–27 is added and reads as follows:

§ 86.084–27 Special test procedures.

(a) For light-duty vehicles and light-duty trucks the Administrator may, on the basis of a written application therefore by a manufacturer, prescribe test procedures, other than those set forth in this part, for any motor vehicle which he determines is not susceptible to satisfactory testing by the procedures set forth herein or in Subpart B of this part.

(b) For heavy-duty engines:

(1) The Administrator may, on the basis of a written application by a manufacturer, prescribe test procedures, other than those set forth in this subpart, for any motor-vehicle engine, which he determines is not susceptible to satisfactory testing by the procedures set forth herein or in Subparts N, I, and P of this part.

(2) If the manufacturer does not submit a written application for use of special test procedures but the Administrator determines that a motor-vehicle engine is not susceptible to satisfactory testing by the procedures set forth herein, the Administrator will reject the applicable portions of the application. The Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection in accordance with the provisions of § 86.084–22(c).

15. A new § 86.084–28 is added and reads as follows:

§ 86.084–28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The applicable exhaust and fuel evaporative emission standards of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards is as follows:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer.

(A) The applicable results to be used in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.079–26(a)(4) except the zero-mile tests. These shall include the official test results, as determined in § 86.079–29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.079–24(c) (including all vehicles elected to be operated by the manufacturer under § 86.079–24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.079–25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.079–25, in those cases where

the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in § 86.078–8 or § 86.079–9, as applicable, or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard. An exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor-Exhaust emissions interpolated to 50,000 miles ÷ exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(C) An evaporative emissions deterioration factor shall be determined from the testing conducted as described in § 86.079–21(b)(4)(ii), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor-Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the 4,000-mile test point shall be multiplied by the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results for each evaporative emission-data vehicle at the 4,000-mile test point shall be adjusted by addition of the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard shall be the adjusted emissions of paragraph (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29–67, to two significant figures. The rounded emission values may not exceed the standard.

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standards, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for gasoline-fueled engines in § 86.084–10 or for diesel engines in § 86.084–11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of an engine with emission standards, based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For gasoline and diesel engines, separate factors shall be established for transient HC, CO, and NO_x. For gasoline-fueled engines, a separate factor shall be established for idle CO. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and the peak opacity (designated as "C").

(iii)(A) For transient HC, CO, and NO_x (and, in the case of gasoline-fueled engines, for idle CO), the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(4)(iii) of this section rounded to two significant figures in accordance with ASTM E 29–67 for each emission-data engine.

(5) [Reserved]

(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iv) of this section, before any engine in that family will be certified.

16. A new § 86.084–29 is added and reads as follows:

§ 86.084–29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment

used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer. *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.079–26(a)(3)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data:

(iii)(A)(1) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.081–22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.081–22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.079–23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the vehicle before it accumulated any mileage, all other parameters being adjusted identically for the purpose of comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(2) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.081–22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.079–35 (a)(1)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(1) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.081–22(e)(1) may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.081–22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the vehicle before it accumulated any mileage, all other parameters being adjusted identically for the purpose of comparison. Other maintenance or repairs may be performed in accordance with § 86.079–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(2) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer: *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending

retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.084–22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.084–22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.084–23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.084–22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.084–35(a)(2)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed.

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.084–22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.084–22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.084–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraph (b)(3)(iii)(B) (*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

17. A new § 86.084–30 is added and reads as follows:

§ 86.084–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078–7(c) and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraph (c) of this section.

(i) Each certificate of conformity shall state the altitude(s) at which the vehicle(s) covered by the certificate has demonstrated compliance with the applicable emission standards.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

> This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the model year production period of the said manufacturer, as defined in 40 CFR § 86.079–2.
>
> It is a term of this certificate that the manufacturer shall consent to all inspections described by 40 CFR §§ 86.078–7(c), 86.606, and 86.1006 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate as specified in 40 CFR § 86.084–30 (c), (d), or (e). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.079–30 (c), (d), or (e).

(3) One such certificate will be issued for each engine family and will certify compliance with no more than one set of applicable standards except that for gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination and will certify compliance with no more than one set of applicable standards.

(4) [Reserved]

(5) The counties identified below have substantially all of their area located above 1,219 meters (4,000 ft.):

Counties Located Substantially Above 1,219 Meters (4,000 feet) in Elevation

State of Arizona

Apache, Navajo.

State of Colorado

Adams, Alamosa, Arapahoe, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Crowley, Custer, Dolores, Delta, Denver, Douglas, Eagle, Elbert, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison,

Hinsdale, Huerfano, Jackson, Jefferson, Lake, La Plata, Larimer, Las Animas, Lincoln, Mesa, Mineral, Moffat, Montezuma, Montrose, Morgan, Ouray, Park, Pitkin, Pueblo, Rio Blanco, Rio Grande, Routt, Saguache, San Juan, San Miguel, Summit, Teller, Washington, Weld.

State of Idaho

Bannock, Bear Lake, Bingham, Blaine, Bonneville, Butte, Camas, Caribou, Cassia, Clark, Custer, Franklin, Fremont, Jefferson, Madison, Minidoka, Oneida, Power, Teton, Valley.

State of Montana

Beaverhead, Deer Lodge, Gallatin, Jefferson, Madison, Meagher, Park, Silver Bow.

State of Nebraska

Banner, Kimball, Sioux.

State of Nevada

Carson City, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lyon, Mineral, Storey, White Pine.

State of New Mexico

Bernalillo, Catron, Colfax, Curry, DeBaca, Grant, Guadalupe, Harding, Lincoln, Los Alamos, Luna, McKinley, Mora, Rio Arriba, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia.

State of Oregon

Lake.

State of Utah

Beaver, Box Elder, Cache, Carbon, Daggett, Davis, Duchesne, Emery, Grand, Iron, Juab, Kane, Millard, Morgan, Piute, Rich, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Wayne, Weber.

State of Wyoming

Albany, Carbon, Converse, Fremont, Goshen, Hot Springs, Johnson, Laramie, Lincoln, Natrona, Niobrara, Park, Platte, Sublette, Sweetwater, Teton, Uinta, Weston.

(6) [Reserved]

(7) Certificates issued for light-duty vehicles or light-duty trucks certified with catalytic converters shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "Catalyst-equipped vehicles, otherwise covered by this certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of this certificate unless included in a catalyst control program operated by a manufacturer or a United States Government Agency and approved by the Administrator."

(8) Certificates issued for incomplete light-duty trucks shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "For incomplete light-duty trucks, this certificate covers only those new motor vehicles which when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in 40 CFR 86.079–21(d)."

(9) Certificates issued for heavy-duty engines shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "For heavy-duty engines, this certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in 40 CFR 86.079–2."

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles and light-duty trucks.*

(A) The durability-data vehicle(s) selected under § 86.078–24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(ii), (b)(1)(iii), and (b)(1)(iv) shall represent all vehicles of the same engine-system combination as applicable to be sold below 4,000 feet.

(C) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(vii)(A) and (b)(1)(vii)(B) shall represent all vehicles of the same evaporative control system within the evaporative family, as applicable, to be sold below 4,000 feet.

(D) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(E) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(vii)(D) shall represent all vehicles of the same evaporative control system within the evaporative family, sold at high altitude.

(ii) *Heavy-Duty Engines.* (A) A gasoline-fueled emission-data test engine selected under § 86.080–24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission-data test engine selected under § 86.080–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.084–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.084–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(E) [Reserved]

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.078–29, data or information derived from any inspection carried out under § 86.078–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at his option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards for which it was tested:

(i) Request a hearing under § 86.078–6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (i.e., one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emissions standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from his application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.078–24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacture may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078–6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engine so deleted may be included in a later request for certification under § 86.078–32.) The Administrator will then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, shall then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the requested data under paragraphs (b)(4) or (b)(5) (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto.

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078–7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or build up into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(1)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078–7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(v) [Reserved]

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078–7(c) in fact occurred, the manufacturer, if he wished to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078–6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078–6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue he will grant the request with respect to such issue.

(d) *For light-duty vehicles and light-duty trucks.*—(1) *For light-duty vehicles*

and light-duty trucks. Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of comformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606.

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606 to

(A) Monitor vehicle selection pursuant to § 86.607,

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, 86.607, 86.608, 86.610, or 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (d)(1) (i), (ii) or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraphs (d)(1) (iii), (iv), (v), (vi), (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under either paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(e) *For heavy-duty vehicles and engines.*

(1) Notwithstanding the fact that any engine configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the data of such fraudulent act.

(5) In any case in which certification of a heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the engine configuration or engine family in

question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014 and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

18. A new § 86.084–35 is added and reads as follows:

§ 86.084–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.079–30(a).

(1) *Light-duty vehicles and light-duty trucks.*—(i) *A permanent, legible label shall be affixed in a readily visible position in the engine compartment.*

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The Label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of the manufacturer;

(C) Engine displacement (in cubic inches), engine, family identification and evaporative family identification;

(D) Engine tuneup specifications and adjustments, as recommended by the manufacturer to the ultimate purchaser, including but not limited to idle speed(s), ignition timing, and idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable) as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air-conditioner), if any, should be in operation. If a manufacturer provides tuneup specifications and adjustments for his vehicle for operation at an altitude other than that at which compliance was demonstrated, e.g., adjustments for operation below 1,219 meters for vehicles which demonstrated compliance at elevations above 1,219 meters, the manufacturer may either include these specifications and adjustments on his engine compartment label, or may indicate on the label where these adjustments might be found, i.e., by reference to the owner's manual or shop manual.

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles or light-duty trucks;

(F) The altitude at which the vehicle has demonstrated compliance with the applicable emission standards as specified by the certificate of conformity issued under § 86.079–30. (An example of an acceptable statement is: "Compliance demonstrated above/below 4,000 feet.")

(2) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: IMPORTANT ENGINE INFORMATION.

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year);

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) For gasoline-fueled engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash.

(G) For Diesel engines the label should include the advertised hp. at rpm, fuel rate at advertised hp. in mm ^{3}/stroke, valve lash, initial injection timing, and idle speed.

(H) The prominent statement: "(Manufacturer's corporate name) has determined that this engine has an average useful life of —— miles or —— hours of operation, whichever occurs first." The manufacturer may alter this statement only to express the useful life in terms other than miles or hours (e.g., years, or hours only).

(I) The subordinate addition to the statement in subparagraph (2)(iii)(H) of this paragraph: "This engine's actual life may vary depending on its service application. (For additional information see the owner's maintenance instructions.) This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines for its useful life."

(iv) The label may be made up of one or more pieces: *Provided,* That all pieces are permanently attached to the same engine or vehicle part as applicable.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable State emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards of this subpart, shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth, on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 49 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The heading: "Vehicle Emission Control Information";

(ii) The statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 1979 Model Year New Motor Vehicles."

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as noncatalyst-equipped: "NON-CATALYST;"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST-APPROVED FOR IMPORT;"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST."

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following statement printed on the label required in paragraph (a)(1) of this section in lieu of the statement required by paragraph (a)(1)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Motor Vehicles when completed at a maximum curb weight of — pounds and a maximum frontal area of — square feet."

(e)(1) Incomplete heavy-duty vehicles having an 8,500-pound gross vehicle weight rating or less shall have the following prominent statement printed on the label required in paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(H) of this section: "(Manufacturer's corporate name) has determined that this engine has an average useful life of —— miles or —— hours of operation, whichever occurs first." The manufacturer may alter this statement only to express the useful life in terms other than miles or hours (e.g., years, or hours only).

(2) The subordinate addition to the statement in subparagraph (1) of this paragraph: "This engine's actual life may vary depending on its service application. (For additional information see the owner's maintenance instructions.) This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area greater than 45 square feet for its useful life."

(f) The manufacturer of any incomplete vehicle shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emissions certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with the National Highway Traffic Safety Administration safety notification requirements published in 49 CFR part 568.

19. A new § 86.084–38 is added and reads as follows:

§ 86.084–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in §§86.078–8 through 86.078–11 as applicable, written instructions for the maintenance and use of the vehicle (or engine) by the purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(c) For gasoline-fueled light-duty vehicles and light-duty trucks.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.078–25(a), and shall explain the conditions under which EGR system and catalytic converter maintenance are to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) [Reserved]

(3) [Reserved]

(d) For Diesel light-duty vehicles and light-duty trucks.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.078–25(a) and shall explain the conditions under which EGR system and catalytic converter maintenance are to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) [Reserved]

(e) *For heavy-duty engines.*

(1) Maintenance instructions shall specify the performance of all scheduled emission-related maintenance approved by the Administrator under § 86.084–25(c). Scheduled emission-related maintenance in addition to that performed under § 86.084–25(c) may be recommended for reasons such as to offset the effects of operating conditions which differ from the conditions experienced by the durability-data engines. Such additional recommended maintenance shall be clearly differentiated, in a form approved by the Administrator from that approved under § 86.084–25(c). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

(2) Such instructions shall specify the useful life of the engine as determined by the manufacturer under § 86.084–21(b)(4)(ii)(B). This period of use shall be expressed as a period of engine or vehicle operation or as an equivalent vehicle mileage (or both). The manufacturer shall also present the method(s) by which the need for engine rebuild can be determined, including the criteria and values required in § 86.084–21(b)(4)(ii)(C) and the necessary measurement equipment and instrumentation. The manufacturer shall also include in the instructions an explanation of how it determined both the average useful life and the values of the rebuild criteria. An explanation may be included of how the useful life is determined for an individual engine (the first occurring of either the average useful life or the need for rebuild) and of how the actual useful lives of engines used in various applications are expected to differ from the average useful life. The explanation(s) shall be in clear, nontechnical language that is understandable to the ultimate purchaser.

20. A new § 86.084–39 is added and reads as follows:

§ 86.084–39 Automatic expiration of reporting and recordkeeping requirements.

(a) [Reserved]

(b) [Reserved]

(c) *Heavy-duty engines.*

(1) All of the recordkeeping and reporting requirements in this subpart for which 1984 is the first model year of implementation shall automatically

expire on December 31, 1988, unless the Administrator acts to retain them.

(2) If the Administrator determines that the reporting and recordkeeping requirements should be retained he/she shall also at that time establish the subsequent date of expiration, which shall not be later than December 31, 1993.

21. A new § 86.085–11 is added and reads as follows:

§ 86.085–11 Emission standards for 1985 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1985 and later model year diesel heavy-duty engines shall not exceed the following:

(i) *Hydrocarbons.* 1.3 grams per brake horsepower hour, as measured under transient operating conditions (Subpart N).

(ii) *Carbon monoxide.* (A) 15.5 grams per brake horsepower hour as measured under transient operating conditions (Subpart N).

(iii) *Oxides of nitrogen.* 10.7 grams per brake horsepower hour, as measured under transient operating conditions (Subpart N).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust over operating schedules as set forth in Subparts N or P and measured and calculated in accordance with those procedures.

(b)(1) The opacity of spoke emissions from new 1984 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1984 model year naturally-aspirated diesel heavy-duty engine. This provision does not apply to turbocharged engines.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subparts I, N, or P of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b), and (c) of this section.

22. A new Subpart K is added to Part 86 and reads as follows:

Subpart K—Selective Enforcement Auditing of New Gasoline-Fueled and Diesel Heavy-Duty Engines

Sec.

Subpart K—Selective Enforcement Auditing of New Gasoline-Fueled and Diesel Heavy-Duty Engines

§ 86.1001–84 Applicability.

All provisions of this subpart are applicable for 1984 and later model year gasoline-fueled and diesel heavy-duty engines, effective January 1, 1984.

§ 86.1002–84 Definitions.

(a) The definitions in this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act.

"Acceptable Quality Level" (AQL) means the maximum percentage of failing engines that, for purposes of sampling inspection, can be considered satisfactory as a process average.

"Configuration" means a subclassification, if any, of an engine family for which a separate projected sales figure is listed in the manufacturer's Application for Certification and which can be described on the basis of emission control system, governed speed, injector size, engine calibration, and other parameters which may be designated by the Administrator.

"In the Hands of the Manufacturer" means that engines are still in the possession of the manufacturer and have not had their bills of lading transferred to another person for the purpose of transporting.

"Test Sample" means the collection of engines of the same configuration which have been selected to receive exhaust emission testing.

§ 86.1003–84 Test orders.

(a) The Administrator will require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Enforcement or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of the applicable sections of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c)(1) The test order will specify the engine configuration selected for testing, the manufacturer's vehicle or engine assembly plant or associated storage facility from which the engines must be selected, the time and location at which engines must be selected, and the procedure by which engines of the specified configuration must be selected. The test order may include alternative configurations to be selected for testing in the event that engines of the first specified configuration are not available for testing because such engines are not being manufactured at the specified assembly plant, not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facility. In addition, the test order may include other directions or information essential to the administration of the required testing.

(2) The following instructions are applicable to each test order issued under this subpart:

(i) The manufacturer shall make the following documents available to EPA Enforcement Officers upon request:

(A) A properly filed and current application for certification, following the format prescribed by the EPA for the appropriate model year; and

(B) A copy of the shop manual and dealer service bulletins for the configurations being tested.

(ii) Only one mechanic at a time per engine shall make authorized checks, adjustments, or repairs, unless a particular check, adjustment, or repair requires a second mechanic as indicated in the shop manual or dealer service bulletins.

(iii) A mechanic shall not perform any check, adjustment, or repair without an

Enforcement Officer present unless otherwise authorized.

(iv) The manufacturer shall utilize only those tools and test equipment utilized by its dealers or those dealers using its engines when performing authorized checks, adjustments, or repairs.

(d) A manufacturer may indicate preferred assembly plants or associated storage facilities for the various engine families produced by the manufacturer for selection of engines in response to a test order. This shall be accomplished by submitting a list of engine families and the corresponding assembly plants or associated storage facilities from which the manufacturer desires to have engines selected for testing. In order that a manufacturer's preferred location be considered for inclusion in a test order for a configuration of a particular engine family, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may order testing at other than a preferred plant.

(e) Upon receipt of a test order, a manufacturer shall proceed in accordance with the provisions of this subpart.

(f)(1) During a given model year, the Administrator will not issue to a heavy-duty engine manufacturer more Selective Enforcement Auditing (SEA) test orders than an annual limit determined by dividing the projected sales of all of its heavy-duty engines bound for the United States market for that year, as made by the manufacturer in its Application for Certification, by 30,000 and rounding to the nearest whole number, unless the projected sales are less than 15,000, in which case the number is one.

(2) Any SEA test order for which the configuration fails in accordance with § 86.1010–84 or for which testing is not completed will not be counted against the annual limit.

(3) When the annual limit has been met, the Administrator may issue additional test orders for those configurations for which evidence exists indicating noncompliance. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

§ 86.1004–84 Testing by the Administrator.

(a) The Administrator may require by test order that engines of a specified configuration be selected in a manner consistent with the requirements of § 86.1007–84 and submitted to him at such place as he may designate for the purpose of conducting emission tests. These tests shall be conducted in accordance with § 86.1008–84 of these regulations to determine whether engines manufactured by the manufacturer conform with the regulations with respect to which the certificate of conformity was issued.

(b)(1) Whenever the Administrator conducts a test on a test engine or the Administrator and manufacturer each conduct a test on the same test engine, the results of the Administrator's test shall comprise the official data for that engine.

(2) Whenever the manufacturer conducts all tests on a test engine, the manufacturer's test data will be accepted as the official data: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a) of this section that there is a substantial lack of agreement between the manufacturer's test results and the Adminstrator's test results, no manufacturer's test data from the manufacturer's test facility will be accepted for purposes of this subpart.

(c) In the event that testing conducted under paragraph (a) of this section demonstrates a lack of agreement under paragraph (b)(2) of this section, the Administrator will:

(1) Notify the manufacturer in writing of his determination that the test facility is inappropriate for conducting the tests required by this subpart and the reasons therefor, and

(2) Reinstate any manufacturer's data upon a showing by the manufacturer that the data acquired under paragraph (a) of this section was erroneous and the manufacturer's data was correct.

(d) The manufacturer may request in writing that the Administrator reconsider his determination in paragraph (b)(2) of this section based on data or information which indicates that changes have been made to the test facility and such changes have resolved the reasons for disqualification.

§ 86.1005–84 Maintenance of records; submittal of information.

(a) The manufacturer of any new heavy-duty engine subject to any of the provisions of this subpart shall establish, maintain, and retain the following adequately organized and indexed records:

(1) *General records.* A description of all equipment used to test engines in accordance with § 86.1008–84, pursuant to a test order issued under this subpart, specifically—

(i) If testing heavy-duty gasoline engines, the equipment requirements specified in §§ 86.1306–84 and 86.1506–84 of this part; and

(ii) If testing heavy-duty diesel engines, the equipment requirements specified in §§ 86.1306–84, 86.1506–84, 86.879–6, 86.879–8, and 86.879–9 of this part. (§ 86.306–79 for Subpart D testing only.)

(2) *Individual records.* These records pertain to each audit conducted pursuant to this subpart.

(i) A complete record of all emission tests performed pursuant to this subpart (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each test, or exact copies thereof, specifically—

(A) If testing heavy-duty gasoline engines, the record requirements specified in §§ 86.1342–84 and 86.1542–84 of this part; and

(B) If testing heavy-duty diesel engines, the record requirements specified in §§ 86.1342–84, 86.1542–84, and 86.879–10. (§ 86.337–79 for Subpart D testing only.)

(ii) The date, time, and location of each test; the number of hours of service accumulated on each engine when the test began and ended; and the names of all personnel, including supervisory personnel, involved in the conduct of the audit.

(iii) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and names of all personnel involved in the supervising and performance of the repair.

(iv) The date when the engine was shipped from the assembly plant or associated storage facility and when it was received by the test facility.

(v) A brief description of any significant events, commencing with the test engine selection process, but not described by any entry under one of the previous headings, including such extraordinary events as engine damage during shipment.

(b) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure: *Provided,* That in every case all the information contained in the hard copy shall be retained.

(c) Heavy-duty engine manufacturers shall submit to the Administrator on a quarterly basis no later than thirty days after the close of each calendar quarter or other reporting schedule as approved by the Administrator all emission data,

whether or not from FTP testing, from testing of production engines. The following information shall be provided with respect to such engines:

(1) Description of quality audit or other program under which production engines are tested including a description of sampling plans, method of sample selection, sampling rates, and emission test employed.

(2) EPA engine family.

(3) Engine identification number.

(4) Configuration.

(5) Engine model year and build date.

(6) Number of hours of service accumulated on engine prior to testing.

(7) Description of any preparation, maintenance, modification or repair on test engines.

(8) Emission test results for each valid test. If the above information is available on Automatic Data Processing (ADP) equipment, it shall be submitted on an ADP storage device such as magnetic tape, magnetic disc, punched cards, etc.: *Provided,* That the manufacturer's storage device is compatible with EPA's ADP equipment. EPA will return ADP equipment submitted by the manufacturer or, upon a request by the manufacturer, furnish the necessary ADP storage devices. Information submitted once need not be submitted again if there are no subsequent changes.

(d) Pursuant to a request made by the Administrator, the manufacturer shall submit to him the following information with regard to engine production:

(1) Number of engines, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of engines, by configuration and assembly plant, produced during the time period designated in the request which are complete for introduction into commerce.

(e) Nothing in this section shall limit the Administrator's discretion in requiring the manufacturer to retain additional records or submit information not specifically required by this section.

(f) All reports, submissions, notifications, and requests for approvals made under this subpart shall be addressed to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN–340, 401 M Street S.W., Washington, D.C. 20460.

§ 86.1006–84 Entry and access.

(a) In order to allow the Administrator to determine whether a manufacturer is complying with the provisions of this subpart and a test order issued thereunder, EPA Enforcement Officers are authorized to enter during operating hours and upon presentation of credentials any of the following:

(1) Any facility where any engine to be introduced into commerce or any emission related component is manufactured, assembled, or stored;

(2) Any facility where any tests conducted pursuant to a test order or any procedures or activities connected with such tests are or were performed;

(3) Any facility where any engine which is being tested, was tested, or will be tested is present; and

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in paragraph (a) of this section, EPA Enforcement Officers are authorized to perform the following inspection-related activities:

(1) To inspect and monitor any aspects of such engine manufacture, assembly, storage, testing and other procedures, and the facilities in which such procedures are conducted;

(2) To inspect and monitor any part or aspect of such test procedures or activities, including, but not limited to, monitoring engine selection, preparation, service accumulation, preconditioning, emission test cycles, and maintenance; and to verify calibration of test equipment;

(3) To inspect and make copies of any records or documents related to the assembly, storage, selection and testing of an engine in compliance with a test order; and

(4) To inspect and photograph any part or aspect of any such engine and any component used in the assembly thereof that is reasonably related to the purpose of the entry.

(c) EPA Enforcement Officers are authorized to obtain reasonable assistance without charge from those in charge of a facility to help them discharge any function listed in this subpart and are authorized to request the recipient of a test order to make arrangements with those in charge of a facility operated for its benefit to furnish such reasonable assisitance without charge to EPA whether or not the recipient controls the facility.

(d) EPA Enforcement Officers are authorized to seek a warrant or court order authorizing the EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section, as appropriate, to execute the functions specified in this section. EPA Enforcement Officers may proceed *ex parte* to obtain a warrant whether or not the Enforcement Officers first attempted to seek permission of the recipient of the test order or the party in charge of the facilities in question to conduct activities related to entry and access as authorized in this section.

(e) EPA Enforcement Officers who present a warrant or court order as described in paragraph (d) of this section shall be permitted to conduct activities related to entry and access as authorized in this section and as described in the warrant or court order. A recipient of a test order is required to cause those in charge of its facility or a facility operated for its benefit to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section pursuant to a warrant or court order whether or not the recipient controls the facility. In the absence of such a warrant or court order, EPA Enforcement Officers may conduct activities related to entry and access as authorized in this section only upon the consent of the recipient of the test order or the party in charge of the facilities in question.

(f) It is not a violation of this Part or the Clean Air Act for any person to refuse to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section without a warrant or court order.

(g) A manufacturer is responsible for locating its foreign testing and manufacturing facilities in jurisdictions in which local foreign law does not prohibit EPA Enforcement Officers from conducting the entry and access activities specified in this section. EPA will not attempt to make any inspections which it has been informed that local foreign law prohibits.

(h) For purposes of this section:

(1) "Presentation of Credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(2) Where engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph (h)(2) of this section are concerned, "operating hours" shall mean all times during which an assmbly line is in operation, or engine assembly is taking place, or all times during which testing, repair, service accumulation, preparation or compilation of records, or any other procedure or activity related to testing, or to engine manufacture or assembly is being carried out in a facility.

(4) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpreting and translating services, and the making available on an EPA Enforcement Officer's request of personnel of the facility being inspected

during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions. Any employee whom an EPA Enforcement Officer requests the manufacturer to cause to appear for questioning will be entitled to be accompanied, represented and advised by counsel.

§ 86.1007-84 Sample selection.

(a) Engines comprising a test sample which are required to be tested, pursuant to a test order issued in accordance with this subpart, will be selected at the location and in the manner specified in the test order. If a manufacturer determines that the test engines can not be selected in the manner specified in the test order, an alternative selection procedure may be employed: *Provided,* That the manufacturer requests approval of the alternative procedure in advance of the start of test sample selection and that the Administrator approves the procedure.

(b) The test engines of the configuration selected for testing shall have been assembled by the manufacturer for distribution in commerce using his normal mass production processes. If the test engines are selected at a location where they do not have their operational and emission control systems installed, the test order will specify the manner and location for selection of components to complete assembly of the engines. The manufacturer shall assemble these components onto the test engines using normal assembly and quality control procedures as documented by the manufacturer.

(c) No quality control, testing, or assembly procedures shall be used on the completed test engine or any portion thereof, including parts and subassemblies, that will not be used during the production and assembly of all other engines of that configuration.

(d) The test order may specify that EPA Enforcement Officers, rather than the manufacturer, will select the test engines according to the method specified in the test order.

(e) The order in which test engines are selected determines the order in which test results are to be used in applying the sampling plan in accordance with § 86.1010-84.

(f) The manufacturer shall keep on hand all untested engines comprising the test sample until a pass or fail decision is reached in accordance with §86.1010-83(d). The manufacturer may ship any tested engine which has not failed in accordance with §86.1010-84(b). However, once the manufacturer ships any test engine, it relinquishes the prerogative to conduct retests as provided in § 86.1008-84(i).

§ 86.1008-84 Test procedures.

(a)(1) The prescribed test procedure is the Federal Test Procedure as described in Subparts N, I and P of this Part.

(2) If a heavy-duty diesel engine manufacturer uses the test procedure in Subpart D of this part to certify 1984 model year engines pursuant to § 86.084-11(a)(1)(i)(B), (a)(1)(ii)(B), (a)(1)(iii)(B), and (a)(2), that manufacturer shall use the test procedure in Subpart D when conducting emission tests on those engines pursuant to this subpart.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines selected for testing and shall not perform any emission tests on engines selected for testing pursuant to the test order unless such adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's engine assembly and inspection procedures and are actually performed or unless such adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1984 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.084-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.084-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(c) The manufacturer may accumulate up to 125 hours of service on each selected engine prior to performing exhaust emission testing. Service accumulation may be performed in any manner the manufacturer desires.

(1) The manufacturer shall accumulate service at a minimum rate of 16 hours during each 24 hour period, unless otherwise provided by the Administrator.

(2) Service accumulation shall be performed on a sufficient number of test engines during each 24 hour period to assure that the number of engines tested per day fulfills the requirements of paragraph (g) of this section.

(d) No maintenance will be performed on test engines after selection for testing nor will any test engine substitution or replacement be allowed, unless requested of the Administrator by the manufacturer and approved by the Administrator in advance of the performance of any maintenance or engine substitution.

(e) The manufacturer will be allowed 24 hours to ship test engines from the assembly plant or associated storage facility to the test facility if the test facility is not located at or in close proximity to the plant or storage facility: *Except,* That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If an engine is incapable of completing the service accumulation or emission tests because of engine malfunction, the manufacturer may request that the Administrator authorize the repair or replacement of the engine. Any replacement engines will be selected in a manner prescribed in the test order.

(g) Within one working day of receipt of the test order, the manufacturer shall notify the Administrator which test facility will be used to comply with the test order. If no test cells are available at a desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(1) Heavy-duty engine manufacturers with projected annual sales of all of its heavy-duty engines bound for the United States market of 30,000 or greater, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of two engines per 24 hour period, including voided tests.

(2) Heavy-duty engine manufacturers with projected annual sales of all of its heavy-duty engines bound for the United States market of less than 30,000,

as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of one engine per 24 hour period, including voided tests.

(3) The Administrator may approve a longer period of time for conducting emission tests based upon a request by a manufacturer accompanied by a satisfactory justification.

(h) The manufacturer shall perform test engine selection, shipping, preparation, service accumulation, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer will be permitted to retest any engines tested during a Selective Enforcement Audit once a fail decision for the audit has been reached in accordance with § 86.1010–84(d) based on the first test on each engine. Each engine can be tested a total of three times but they all must be tested the same number of times. The manufacturer may accumulate additional service before conducting a retest, although the total amount of service accumulation on each engine prior to testing shall not exceed 125 hours.

§ 86.1009–84 Calculation and reporting of test results.

(a) Initial test results shall be calculated following the Federal Test Procedure specified in paragraph (a) of § 86.1008–84.

(b) Final test results shall be calculated by summing the initial test results derived in paragraph (a) of this section for each test engine, dividing by the number of tests conducted on the engine, and rounding in accordance with ASTM E29–67 to two places to the right of the decimal point.

(c) *Final deteriorated test results.* (1) The final deteriorated test results for each engine tested according to Subpart D, N or P of this Part shall be calculated by multiplying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs. If the deterioration factor computed during the certification process is less than one, that deterioration factor will be one.

(2) The final deteriorated test results for each engine tested according to Subpart I of this Part shall be calculated by adding the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs, to the final test results. If the deterioration factor computed during the certification process is less than zero, that deterioration factor will be zero.

(3) The final deteriorated test results shall be rounded, in accordance with ASTM E29–67, to the number of decimal places contained in the appropriate standard.

(d) Within five working days after completion of testing of all engines pursuant to a test order, the manufacturer shall submit to the Administrator a report which shall include the following:

(1) The location and description of the manufacturer's exhaust emission test facilities which were utilized to conduct testing reported pursuant to this section.

(2) The applicable standards against which the engines were tested.

(3) Deterioration factors for the engine family to which the selected configuration belongs.

(4) A description of the engine and any emission related component selection method used.

(5) For each test conducted,

(i) Test engine description, including:

(A) Configuration and engine family identification,

(B) Year, make, and build date,

(C) Engine identification number, and

(D) Number of hours of service accumulated on engine prior to testing.

(ii) Location where service accumulation was conducted and description of accumulation procedure and schedule.

(iii) Test number, date, initial test results before and after rounding, final test results and final deteriorated test results for all exhaust emission tests, whether valid or invalid, and the reason for invalidation, if applicable.

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine and has not been reported pursuant to any other paragraph of this subpart and will not be performed on all other production engines.

(v) Where a replacement engine was authorized by the Administrator, the reason for the replacement and the information in paragraph (d)(5)(iii) of this section, if any, for the replacement engine.

(vi) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued.

(6) The following statement and endorsement: This report is submitted pursuant to section 206 and section 208 of the Clean Air Act. All testing for which data is reported herein was conducted in strict conformance with applicable regulations under 40 CFR Part 86 et seq. All the data reported herein is a true and accurate representation of such testing. All other information reported herein is, to the best of

Company name ———————————

knowledge, true and accurate. I am aware of the penalties associated with violations of the Clean Air Act and the regulations thereunder.

Authorized company representative ———————

§ 86.1010–84 Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

(a) The prescribed acceptable quality level is 10 percent.

(b) A failed engine is one whose final deteriorated test results pursuant to § 86.1009–84(c), for one or more of the applicable exhaust pollutants, exceed the applicable emission standard.

(c) The manufacturer shall test engines comprising the test sample until a pass decision is reached for all pollutants or a fail decision is reached for one pollutant. A pass decision is reached when the cumulative number of failed engines, as defined in paragraph (b) of this section, for each pollutant is less than or equal to the pass decision number appropriate to the cumulative number of engines tested. A fail decision is reached when the cumulative number of failed engines for one or more pollutants is greater than or equal to the fail decision number appropriate to the cumulative number of engines tested. The pass and fail decision numbers associated with the cumulative number of engines tested shall be determined by use of the tables in Appendix X of this part appropriate for the annual projected sales as made by the manufacturer in its Application for Certification. In the Tables in Appendix X, sampling plan "stage" refers to the cumulative number of engines tested. Once a pass or fail decision has been made for a particular pollutant, the number of engines whose final deteriorated test results exceed the emission standard for that pollutant shall not be considered any further for the purposes of the audit.

(d) Passing or failing of an SEA audit takes place when the decision is made on the last engine required to make a decision under paragraph (c) of this section.

(e) The Administrator may terminate testing earlier than required in paragraph (c) of this section.

(f) [Reserved]

(g) [Reserved]

§ 86.1011-84 [Reserved]

§ 86.1012-84 Suspension and revocation of certificates of conformity.

(a) The certificate of conformity is suspended with respect to any engine failing pursuant to paragraph (b) of § 86.1010-84 effective from the time that testing of that engine is completed.

(b) The Administrator may suspend the certificate of conformity for a configuration which does not pass an SEA, pursuant to paragraph § 86.1010-84(c), based on the first test or all tests conducted on each engine. This suspension shall not occur before ten days after failure to pass the audit.

(c) [Reserved]

(d) [Reserved]

(e) If the results of testing pursuant to these regulations indicate that engines of a particular configuration produced at one plant of a manufacturer do not conform to the regulations with respect to which the certificate of conformity was issued, the Administrator may suspend the certificate of conformity with respect to that configuration for engines manufactured by the manufacturer at all other points.

(f) [Reserved]

(g) The Administrator will notify the manufacturer in writing of any suspension or revocation of a certificate of conformity in whole or in part: *Except,* That the certificate is immediately suspended with respect to any failed engines as provided for in paragraph (a) of this section.

(h) The Administrator may revoke a certificate of conformity for a configuration when the certificate has been suspended pursuant to paragraph (b), (c) or (e) of this section if the proposed remedy for the nonconformity, as reported by the manufacturer to the Administrator, is one requiring a design change or changes to the engine and/or emission control system as described in the Application for Certification of the affected configuration.

(i) Once a certificate has been suspended for a failed engine as provided for in paragraph (a) of this section, the manufacturer must take the following actions:

(1) Before the certificate is reinstated for that failed engine,

(i) Remedy the nonconformity, and

(ii) Demonstrate that the engine conforms to the applicable standards by retesting the engine in accordance with these regulations.

(2) Submit a written report to the Administrator, within five working days after successful completion of testing on the failed engine, which contains a description of the remedy and test results for each engine in addition to other information that may be required by this regulation.

(j) Once a certificate for a failed configuration has been suspended pursuant to paragraph (b), (c) or (e) of this section, the manufacturer must take the following actions before the Administrator will consider reinstating such certificate:

(1) Submit a written report to the Administrator which identifies the reason for the noncompliance of the engines, describes the proposed remedy, including a description of any proposed quality control and/or quality assurance measures to be taken by the manufacturer to prevent future occurrences of the problem, and states the date on which the remedies will be implemented, and

(2) Demonstrate that the engine configuration for which the certificate of conformity has been suspended does in fact comply with these regulations by testing engines selected from normal production runs of that engine configuration, at the plant(s) or associated storage facilities specified by the Administrator, in accordance with the conditions specified in the initial test order; *Except,* That if the manufacturer elects to continue testing individual engines after suspension of a certificate, the certificate is reinstated for any engine actually determined to be in conformance with the applicable standards through testing in accordance with the applicable test procedures: *Provided,* That the Administrator has not revoked the certificate pursuant to paragraph (h) of this section.

(k) Once the certificate has been revoked for a configuration and the manufacturer desires to continue introduction into commerce of such configuration, the following actions shall be taken before the Administrator will consider reissuing such certificate:

(1) If the Administrator determines that the proposed change or changes in engine design may have an effect on emission performance deterioration, he shall so notify the manufacturer within five (5) working days after receipt of the report in paragraph (h) of this section, whether subsequent testing under this subpart will be sufficient to evaluate the proposed change or changes or whether additional testing will be required.

(2) After implementing the change or changes intended to remedy the nonconformity, the manufacturer shall demonstrate that the engine configuration for which the certificate of conformity was revoked does in fact conform with these regulations by testing engines selected from normal production runs of that engine configuration in accordance with the conditions specified in the initial test order. This testing will be considered by the Administrator to satisfy the testing requirements of § 86.078-32 or § 86.079-33 if the Administrator had so notified the manufacturer. If the subsequent audit results in passing of the audit at the level of the standards, the Administrator will reissue or amend the certificate, as the case may be, to include that configuration: *Provided,* That the manufacturer has satisfied the testing requirements specified pursuant to paragraph (j)(2) of this section. If the subsequent audit is failed, the revocation shall remain in effect. Any design change approvals under this subpart shall be limited to the configuration affected by the test order.

(l) At any time subsequent to an initial suspension of a certificate of conformity for a test engine pursuant to paragraph (a) of this section, but not later than fifteen (15) days or such other period as may be allowed by the Administrator after notification of the Administrator's decision to suspend or revoke a certificate of conformity in whole or in part pursuant to paragraphs (b), (c), (d), (e) or (h) of this section, a manufacturer may request a hearing as to whether the tests have been properly conducted or any sampling methods have been properly applied.

(m) After the Administrator suspends or revokes a certificate of conformity pursuant to this section or notifies a manufacturer of his intent to suspend, revoke or void a certificate of conformity under paragraph § 86.084-30(e), and prior to the commencement of a hearing under § 86.1014-84, if the manufacturer demonstrates to the Administrator's satisfaction that the decision to suspend, revoke or void the certificate was based on erroneous information, the Administrator shall reinstate the certificate.

(n) To permit a manufacturer to avoid storing non-test engines when conducting an audit of a configuration subsequent to suspension or revocation of the certificate of conformity for that configuration resulting from failure of an SEA, it may request that the Administrator conditionally reinstate the certificate for that configuration. The Administrator may reinstate the certificate subject to the condition that the manufacturer consents to recall all engines of that configuration produced from the time the certificate is conditionally reinstated if the configuration fails the subsequent audit at the level of the standard and to

remedy any nonconformity at no expense to the owner.

§ 86.1013–84 [Reserved.]

§ 86.1014–84 Hearings on suspension, revocation and voiding of certificate of conformity.

(a) *Applicability.* The procedures prescribed by this section shall apply whenever a manufacturer requests a hearing pursuant to § 86.084–30(e)(6)(i), § 86.084–30(e)(7), or § 86.1012–84(1).

(b) *Definitions.* The following definitions shall be applicable to this section:

(1) "Hearing Clerk" shall mean the Hearing Clerk of the Environmental Protection Agency.

(2) "Manufacturer" refers to a manufacturer contesting a suspension or revocation order directed at the manufacturer.

(3) "Party" shall include the Agency and the manufacturer.

(4) "Presiding Officer" shall mean an Administrative Law Judge appointed pursuant to 5 U.S.C. 3105 (see also 5 CFR Part 930 as amended).

(5) "Judicial Officer" shall mean an officer or employee of the Agency appointed as a Judicial Officer by the Administrator pursuant to this section who shall meet the qualifications and perform functions as follows:

(i) Officer—there may be designated for the purposes of this section one or more Judicial Officers. As work requires, there may be a Judicial Officer designated to act for the purposes of a particular case.

(ii) Qualifications—a Judicial Officer may be a permanent or temporary employee of the Agency who performs other duties for the Agency. Such Judicial Officer shall not be employed by the Office of Enforcement or have any connection with the preparation or presentation of evidence for a hearing held pursuant to this subpart. The Judicial Officer shall be a graduate of an accredited law school and a member in good standing of a recognized Bar Association of any state or the District of Columbia.

(iii) Functions—the Administrator may consult with Judicial Officer or delegate all or part of his authority to act in a given case under this section to a Judicial Officer: *Provided,* That this delegation shall not preclude the Judicial Officer from referring any motion or case to the Administrator when the Judicial Officer determines such referral to be appropriate.

(c) *Request for public hearing.*

(1) If the manufacturer disagrees with the Administrator's decision to suspend, revoke or void a certificate or disputes the basis for an automatic suspension pursuant to § 86.1012–84(a), he may request a public hearing as described in this section. Requests for such a hearing shall be filed with the Administrator not later than 15 days after the Administrator's notification of his decision to suspend or revoke unless otherwise specified by the Administrator. Two copies of such request shall simultaneously be served upon the Director of the Mobile Source Enforcement Division and two copies filed with the Hearing Clerk. Failure of the manufacturer to request a hearing within the time provided shall constitute a waiver of his right to such a hearing. Subsequent to the expiration of the period for requesting a hearing as a right, the Administrator may, in his discretion and for good cause shown, grant the manufacturer a hearing to contest the suspension or revocation.

(2) The request for a public hearing shall contain:

(i) A statement as to which engine configuration is to be the subject of the hearing;

(ii) A concise statement of the issues to be raised by the manufacturer at the hearing: *Provided, however,* That in the case of the hearing requested under § 86.1012–84(1), the hearing shall be restricted to the following issues:

(A) Whether tests have been properly conducted, specifically, whether the tests were conducted in accordance with applicable regulations under this part and whether test equipment was properly calibrated and functioning; and

(B) Whether sampling plans have been properly applied, specifically, whether sampling procedures specified in Appendix X were followed and whether there exists a basis for distinguishing engines produced at plants other than the one from which engines were selected for testing which would invalidate the Administrator's decision under § 86.1012–84(e).

(iii) A statement specifying reasons the manufacturer believes he will prevail on the merits of each of the issues so raised; and

(iv) A summary of the evidence which supports the manufacturer's position on each of the issues so raised.

(3) A copy of all requests for public hearings shall be kept on file in the Office of the Hearing Clerk and shall be made available to the public during Agency business hours.

(d) *Summary decision.*

(1) In the case of a hearing requested under § 86.1012–83(1), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issues specified in § 86.1014–84(c)(2)(ii), the Administrator will enter an order denying the request for a hearing and reaffirming the original decision to suspend or revoke a certificate of conformity, if such decision has been made pursuant to § 86.1012–84(g) at any time prior to the decision to deny the request for a hearing.

(2) In the case of a hearing requested under § 86.084–30(e)(6)(i), to challenge a proposed suspension of a certificate of conformity for the reasons specified in § 86.084–30 (e)(1)(i) or (e)(1)(ii), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issue of whether the refusal to comply with the provisions of a test order or any other requirement of § 86.1003–84 was caused by conditions and circumstances outside the control of the manufacturer, the Administrator will enter an order denying the request for a hearing and suspending the certificate of conformity.

(3) Any order issued under paragraphs (d)(1) or (d)(2) of this section shall have the force and effect of a final decision of the Administrator, as issued pursuant to paragraph (w)(4) of this section.

(4) If the Administrator determines that a genuine and substantial question of fact does exist with respect to any of the issues referred to in paragraphs (d)(1) and (d)(2) of this section, he shall grant the request for a hearing and publish a notice of public hearing in accordance with paragraph (h) of this section.

(e) *Filing and service.*

(1) An original and two copies of all documents or papers required or permitted to be filed pursuant to this section shall be filed with the Hearing Clerk. Filing shall be deemed timely if mailed, as determined by the postmark, to the Hearing Clerk within the time allowed by this section. If filing is to be accomplished by mailing, the documents shall be sent to the address set forth in the notice of public hearing as described in paragraph (h) of this section.

(2) To the maximum extent possible, testimony shall be presented in written form. Copies of written testimony shall be served upon all parties as soon as practicable prior to the start of the hearing. A certificate of service shall be provided on or accompany each document or paper filed with the Hearing Clerk. Documents to be served upon the Director of the Mobile Source Enforcement Division shall be sent by registered mail to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, En–

340, 401 M Street SW., Washington, D.C. 20460.

Service by registered mail is complete upon mailing.

(f) *Time.*

(1) In computing any period of time prescribed or allowed by this section, except as otherwise provided, the day of the act or event from which the designated period of time begins to run shall not be included. Saturdays, Sundays, and Federal legal holidays shall be included in computing any such period allowed for the filing of any document or paper, except that when such period expires on a Saturday, Sunday, or Federal legal holiday, such period shall be extended to include the next following business day.

(2) A prescribed period of time within which a party is required or permitted to do an act shall be computed from the time of service, except that when service is accomplished by mail, three days shall be added to the prescribed period.

(g) *Consolidation.* The Administrator or the Presiding Officer in his discretion may consolidate two or more proceedings to be held under this section for the purpose of resolving one or more issues whenever it appears that such consolidation will expedite or simplify consideration of such issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occured.

(h) *Notice of public hearings.* Notice of a public hearing under this section shall be given by publication in the Federal Register and by such other means as the Administrator finds appropriate to provide notice to the public. To the extent possible hearings under this section shall be scheduled to commence within 14 days of receipt of the application in paragraph (c) of this section.

(i) *Amicus curiae.* Persons not parties to the proceeding wishing to file briefs may do so by leave of the Presiding Officer granted on motion. A motion for leave shall identify the interest of the applicant and shall state the reasons why the proposed amicus brief is desirable.

(j) *Presiding Officer.* The Presiding Officer shall have the duty to conduct a fair and impartial hearing in accordance with 5 U.S.C. sections 554, 556 and 557 and to take all necessary action to avoid delay in the disposition of the proceedings and to maintain order. He shall have all power consistent with Agency rule and with the Administrative Procedure Act necessary to this end, including the following:

(1) To administer oaths and affirmations;

(2) To rule upon offers of proof and exclude irrelevant or repetitious material;

(3) To regulate the course of the hearings and the conduct of the parties and their counsel therein;

(4) To hold conferences for simplification of the issues or any other proper purpose;

(5) To consider and rule upon all procedural and other motions appropriate in such proceedings;

(6) To require the submission of direct testimony in written form with or without affidavit whenever, in the opinion of the Presiding Officer, oral testimony is not necessary for full and true disclosure of the facts;

(7) To enforce agreements and orders requiring access as authorized by law;

(8) To require the filing of briefs on any matter on which he is required to rule;

(9) To require any party or any witness, during the course of the hearing, to state his position on any issue;

(10) To take or cause depositions to be taken whenever the ends of justice would be served thereby;

(11) To make decisions or recommend decisions to resolve the disputed issues on the record of the hearing;

(12) To issue, upon good cause shown, protective orders as described in paragraph (n) of this section.

(k) *Conferences.* (1) At the descretion of the Presiding Officer, conferences may be held prior to or during any hearing. The Presiding Officer shall direct the Hearing Clerk to notify all parties of the time and location of any such conference. At the descretion of the Presiding Officer, persons other than parties may attend. At a conference the Presiding Officer may:

(i) Obtain stipulations and admissions, receive requests and order depositions to be taken, identify disputed issues of fact and law, and require or allow the submission of written testimony from any witness or party;

(ii) Set a hearing schedule for as many of the following as are deemed necessary by the Presiding Officer;

(A) Oral and written statements;

(B) Submission of written direct testimony as required or authorized by the Presiding Officer;

(C) Oral direct and cross-examination of a witness where necessary as prescribed in paragraph (p) of this section; and

(D) Oral argument, if appropriate.

(iii) Identify matters of which official notice may be taken;

(iv) Consider limitation of the number of expert and other witnesses;

(v) Consider the procedure to be followed at the hearing; and

(vi) Consider any other matter that may expedite the hearing or aid in the disposition of the issue.

(2) The results of any conference including all stipulations shall, if not transcribed, be summarized in writing by the Presiding Officer and made part of the record.

(l) *Primary discovery (exchange of witness lists and documents).* (1) At a prehearing conference or within some reasonable time set by the Presiding Officer prior to the hearing, each party shall make available to the other parties the names of the expert and other witnesses the party expects to call, together with a brief summary of their expected testimony and a list of all documents and exhibits which the party expects to introduce into evidence. Thereafter, witnesses, documents, or exhibits may be added and summaries of expected testimony amended upon motion by a party.

(2) The Presiding Officer, may, upon motion by a party or other person, and for good cause shown, by order

(i) restrict or defer disclosure by a party of the name of a witness or a narrative summary of the expected testimony of a witness, and

(ii) prescribe other appropriate measures to protect a witness. Any party affected by any such action shall have an adequate opportunity, once he learns the name of a witness and obtains the narrative summary of his expected testimony, to prepare for the presentation of his case.

(m) *Other discovery.* (1) Except as so provided by paragraph (l) of this section, further discovery, under this paragraph, shall be permitted only upon determination by the Presiding Officer:

(i) That such discovery will not in any way unreasonably delay the proceeding;

(ii) That the information to be obtained is not obtainable voluntarily; and

(iii) That such information has significant probative value. The Presiding Officer shall be guided by the procedures set forth in the Federal Rules of Civil Procedure, where practicable, and the precedents thereunder, except that no discovery shall be undertaken except upon order of the Presiding Officer or upon agreement of the parties.

(2) The Presiding Officer shall order depositions upon oral questions only upon a showing of good cause and upon a finding that:

(i) The information sought cannot be obtained by alternative methods; or

(ii) There is a substantial reason to believe that relevant and probative evidence may otherwise not be

preserved for presentation by a witness at the hearing.

(3) Any party to the proceeding desiring an order of discovery shall make a motion or motions therefor. Such a motion shall set forth:

(i) The circumstances warranting the taking of the discovery;

(ii) The nature of the information expected to be discovered; and

(iii) The proposed time and place where it will be taken. If the Presiding Officer determines the motion should be granted, he shall issue an order for the taking of such discovery together with the conditions and terms thereof.

(4) Failure to comply with an order issued pursuant to this paragraph may lead to the inference that the information to be discovered would be adverse to the person or party from whom the information was sought.

(n) *Protective orders, in camera proceedings.* (1) Upon motion by a part or by the person from whom discovery is sought, and upon a showing by the movant that the disclosure of the information to be discovered, or a particular part thereof (other than emission data), would result in methods or processes entitled to protection as trade secrets of such person being divulged, the Presiding Officer may enter a protective order with respect to such material. Any protective order shall contain such terms governing the treatment of the information as may be appropriate under the circumstances to prevent disclosure outside the hearing: *Provided,* That the order shall state that the material shall be filed separately from other evidence and exhibits in the hearing. Disclosure shall be limited to parties to the hearing, their counsel and relevant technical consultants, and authorized representatives of the United States concerned with carrying out the Act. Except in the case of the government, disclosure may be limited to counsel for parties who shall not disclose such information to the parties themselves. Except in the case of the government, disclosure to a party or his counsel shall be conditioned on execution of a sworn statement that no disclosure of the information will be made to persons not entitled to receive it under the terms of the protective order. (No such provision is necessary where government employees are concerned because disclosure by them is subject to the terms of 18 U.S.C. 1905.)

(2)(i) A party or person seeking a protective order may be permitted to make all or part of the required showing in camera. A record shall be made of such in camera proceedings. If the Presiding Officer enters a protective order following a showing in camera, the record of such showing shall be sealed and preserved and made available to the Agency or court in the event of appeal.

(ii) Attendance at any in camera proceeding may be limited to the Presiding Officer, the Agency, and the person or party seeking the protective order.

(3) Any party, subject to the terms and conditions of any protective order issues pursuant to paragraph (n)(1) of this section, desiring for the presentation of his case to make use of any in camera documents or testimony shall make application to the Presiding Officer by motion setting forth the justification therefor. The Presiding Officer, in granting any such motion, shall enter an order protecting the rights of the affected persons and parties and preventing unnecessary disclosure of such information, including the presentation of such information and oral testimony and cross-examination concerning it in executive session, as in his discretion is necessary and practicable.

(4) In the submittal of proposed findings, briefs, or other papers, counsel for all parties shall make a good faith attempt to refrain from disclosing the specific details of in camera documents and testimony. This shall not preclude references in such proposed findings, briefs, or other papers to such documents or testimony including generalized statements based on their contents. To the extent that counsel considers it necessary to include specific details in their presentation, such data shall be incorporated in separate proposed findings, briefs, or other papers marked "confidential", which shall become part of the in camera record.

(o) *Motions.* (1) All motions, except those made orally during the course of the hearing, shall be in writing and shall state with particularity the grounds therefor, shall set forth the relief or order sought, and shall be filed with the Hearing Clerk and served upon all parties.

(2) Within such time as may be fixed by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, any party may serve and file an answer to the motion. The movant shall, if requested by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, serve and file reply papers, within the time set by the request.

(3) The Presiding Officer shall rule upon all motions filed or made prior to the filing of his decision or accelerated decision, as appropriate. The Administrator or the judicial officer, as appropriate, shall rule upon all motions filed prior to the appointment of a Presiding Officer and all motions filed after the filing of the decision of the Presiding Officer or accelerated decision. Oral argument of motions will be permitted only if the Presiding Officer, the Administrator or the judicial officer, as appropriate, deems it necessary.

(p) *Evidence.* (1) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record. Immaterial or irrelevant parts of an admissible document shall be segregated and excluded so far as practicable. Documents or parts thereof subject to a protective order under paragraph (n) of this section shall be segregated. Evidence may be received at the hearing even though inadmissible under the rules of evidence applicable to judicial proceedings. The weight to be given evidence shall be determined by its reliability and probative value.

(2) The Presiding Officer shall allow the parties to examine and cross-examine a witness to the extent that such examination and cross-examination is necessary for a full and true disclosure of the facts.

(3) Rulings of the Presiding Officer on the admissibility of evidence, the propriety of examination and cross-examination and other procedural matters shall appear in the record.

(4) Parties shall automatically be presumed to have taken exception to an adverse ruling.

(q) *Record.* (1) Hearings shall be stenographically reported and transcribed and the original transcripts shall be part of the record and the sole official transcript. Copies of the record shall be filed with the Hearing Clerk and made available during Agency business hours for public inspection. Any person desiring a copy of the record of the hearing or any part thereof, except as provided in paragraph (n) of this section, shall be entitled to the same upon payment of the cost thereof.

(2) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record.

(r) *Proposed findings, conclusions.* (1) Within 4 days of the close of the reception of evidence, or within such longer time as may be fixed by the Presiding Officer, any party may submit for the consideration of the Presiding Officer proposed findings of fact, conclusions of law, and proposed order, together with reasons therefor and briefs in support thereof. Such proposals shall be in writing, shall be served upon all parties, and shall contain adequate

references to the record and authorities relied upon.

(2) The record shall show the Presiding Officer's ruling on the proposed findings and conclusions except when his order disposing of the proceeding otherwise informs the parties of the action taken by him thereon.

(s) *Decision of the Presiding Officer.* (1) Unless extended by the Administrator, the Presiding Officer shall issue and file with the Hearing Clerk his decision within 14 days (or within 7 days in the case of a hearing requested under § 86.1012–84(1)) after the period for filing proposed findings as provided for in paragraph (r) of this section has expired.

(2) The Presiding Officer's decision shall become the decision of the Administrator:

(i) when no notice of intention to appeal as described in paragraphs (t) and (u) of this section is filed, 10 days after issuance thereof, unless in the interim the Administrator shall have taken action to review or stay the effective date of the decision; or

(ii) when a notice of intention to appeal is filed but the appeal is not perfected as required by paragraph (t) or (u) of this section, 5 days after the period allowed for perfection of an appeal has expired unless within that 5 day period, the Administrator shall have taken action to review or stay the effective date of the decision.

(3) The Presiding Officer's decision shall include a statement of findings and conclusions, as well as the reasons or basis therefor, upon all the material issues of fact or law presented on the record and an appropriate rule or order. Such decision shall be supported by substantial evidence and based upon a consideration of the whole record.

(4) At any time prior to the issuance of his decision, the Presiding Officer may reopen the proceeding for the reception of further evidence. Except for the correction of clerical errors, the jurisdiction of the Presiding Officer is terminated upon the issuance of his decision.

(t) *Appeal from the decision of the Presiding Officer.* (1) Any party to a proceeding may appeal the Presiding Officer's decision to the Administrator: *Provided,* That within 10 days after issuance of the Presiding Officer's decision such party files a notice of intention to appeal and an appeal brief within 20 days of such decision.

(2) When an appeal is taken from the decision of the Presiding Officer, any party may file a brief with respect to such appeal. The brief shall be filed within 15 days of the date of the filing of the appellant's brief.

(3) Any brief filed pursuant to this paragraph shall contain in the order indicated, the following:

(i) A subject index of the matter in the brief, with page references, and a table of cases (alphabetically arranged), textbooks, statutes, and other material cited, with page references thereto;

(ii) A specification of the issues intended to be urged; provided, however, that in the case of a hearing requested under § 86.1012–84(1), the brief shall be restricted to the issues specified in paragraph (c)(2)(ii) of this section;

(iii) The argument presenting clearly the points of fact and law relied upon in support of the position taken on each issue, with specific page references to the record and the legal or other material relied upon; and

(iv) A proposed order for the Administrator's consideration if different from the order contained in the Presiding Officer's decision.

(4) No brief in excess of 40 pages shall be filed without leave of the Administrator.

(5) Oral argument will be allowed only in the discretion of the Administrator.

(u) *Summary appeal.* (1) In the case of a hearing requested under § 86.1012–84(1), any appeal taken from the decision of the Presiding Officer shall be conducted under this paragraph.

(2) Any party to the proceeding may appeal the Presiding Officer's decision to the Administrator by filing a notice of appeal within 10 days.

(3) The notice of appeal shall be in the form of a brief, and shall conform to the requirements of paragraph (t)(3) of this section.

(4) Within 10 days after a notice of appeal from the decision of the Presiding Officer is filed under this paragraph, any party may file a brief with respect to such appeal.

(5) No brief in excess of 15 pages shall be filed without leave of the Administrator.

(v) *Review of the Presiding Officer's decision in the absence of appeal.* (1) If, after the expiration of the period for taking appeal as provided for by paragraphs (t) or (u) of this section, no notice of intention to appeal the decision of the Presiding Officer has been filed, or if filed, not perfected, the Hearing Clerk shall so notify the Administrator.

(2) The Administrator, upon receipt of notice from the Hearing Clerk that no notice of intention to appeal has been filed, or if filed, not perfected pursuant to paragraphs (t) or (u) of this section, may, on his own motion, within the time limits specified in paragraph (s)(2) of this section, review the decision of the Presiding Officer. Notice of the intention of the Administrator to review the decision of the Presiding Officer shall be given to all parties and shall set forth the scope of such review and the issues which shall be considered and shall make provision for filing of briefs.

(w) *Decision of appeal or review.* (1) Upon appeal from or review of the Presiding Officer's decision, the Administrator shall consider such parts of the record as are cited or as maybe necessary to resolve the issues presented and in addition shall, to the extent necessary or desirable, exercise all the powers which he could have exercised if he had presided at the hearing.

(2) In rendering his decision, the Administrator shall adopt, modify or set aside the findings, conclusions, and order contained in the decision of the Presiding Officer and shall set forth in his decision a statement of the reasons or basis for his action.

(3) In those cases where the Administrator believes that he should have further information or additional views of the parties as to the form and content of the rule or order to be issued, the Administrator, in his discretion, may withhold final action pending the receipt of such additional information or views, or may remand the case to the Presiding Officer.

(4) Any decision rendered under this paragraph which completes disposition of a case shall be a final decision of the Administrator.

(x) *Reconsideration.* (1) Within twenty (20) days after issuance of the Administrator's decision, any party may file with the Administrator a petition for reconsideration of such decision, setting forth the relief desired and the grounds in support thereof. Any petition filed under this subsection must be confined to new questions raised by the decision or final order and upon which the petitioner had no opportunity to argue before the Presiding Officer or the Administrator. *Provided, however,* That in the case of a hearing requested under § 86.1012–84(1) such new questions shall be limited to the issues specified in paragraph (c)(2)(ii) of this section.

(2) Any party desiring to oppose such a petition shall file an answer thereto within ten (10) days after the filing of the petition. The filing of a petition for reconsideration shall not operate to stay the effective date of the decision or order or to toll the running of any statutory time period affecting such decision or order unless specifically so ordered by the Administrator.

(y) *Accelerated decision, dismissal.* (1) The Presiding Officer, upon motion of any party or sua sponte, may at any time render an accelerated decision in favor of the Agency or the manufacturer as to all or any part of the proceeding, without further hearing or upon such limited additional evidence such as affidavits as he may require, or dismiss any party with prejudice, for any of the following reasons:

(i) Failure to state a claim upon which relief can be granted, or direct or collateral estoppel;

(ii) The lack of any genuine issue of material fact, causing a party to be entitled to judgment as a matter of law; or

(iii) Such other and further reasons as are just, including specifically failure to obey a procedural order of the Presiding Officer.

(2) If under this paragraph an accelerated decision is issued as to all the issues and claims joined in the proceeding, the decision shall be treated for the purposes of these procedures as the decision of the Presiding Officer as provided in paragraph (s) of this section.

(3) If under this paragraph, judgment is rendered on less than all issues or claims in the proceeding, the Presiding Officer shall determine what material facts exist without substantial controversy and what material facts are actually and in good faith controverted. He shall thereupon issue an order specifying the facts which appear without substantial controversy, and the issues and claims upon which the hearing will proceed.

(z) *Conclusion of hearing.* (1) If, after the expiration of the period for taking an appeal as provided for by paragraphs (t) and (u) of this section, no appeal has been taken from the Presiding Officer's decision, and after the expiration of the period for review by the Administrator on his own motion as provided for by paragraph (v) of this section, the Administrator does not move to review such decision, the hearing will be deemed to have ended at the expiration of all periods allowed for such appeal and review.

(2) If an appeal of the Presiding Officer's decision is taken pursuant to paragraph (t) and (u) of this section, or if, in the absence of such appeal the Administrator moves to review the decision of the Presiding Officer pursuant to paragraph (v) of this section, the hearing will be deemed to have ended upon the rendering of a final decision by the Administrator.

(aa) *Judicial review.* (1) The Administrator hereby designates the General Counsel, Environmental Protection Agency as the officer upon whom copy of any petition for judicial review shall be served. Such officer shall be responsible for filing in the court the record on which the order of the Administrator is based.

(2) Before forwarding the record to the court, the Agency shall advise the petitioner of costs of preparing it and as soon as payment to cover fees is made, shall forward the record to the court.

23. Part 86 is amended by adding Appendix X as follows:

Appendix X—Sampling Plans for Selective Enforcement Auditing of Heavy-Duty Engines

Table 1—*Sampling Plan Code Letter*

Annual sales	Code letter
50–99	A
100–199	B
200–399	C
400 or greater	D

Table 2—*Sample Plan for Code Letter "A"*

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	3
4	(1)	3
5	(1)	3
6	(1)	3
7	0	3
8	0	4
9	0	4
10	0	4
11	1	4
12	1	4
13	1	5
14	1	5
15	1	5
16	2	5
17	2	5
18	2	5
19	2	6
20	2	6
21	3	6
22	3	6
23	3	6
24	3	6
25	4	6
26	4	7
27	4	7
28	4	7
29	4	7
30	6	7

(1) Test sample passing not permitted at this stage.

(2) Test sample failure not permitted at this stage.

Table 3—*Sample Plan for Code Letter "B"*

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	3
4	(1)	3
5	(1)	3
6	(1)	3
7	0	4
8	0	4
9	0	4
10	0	4
11	0	4
12	1	5
13	1	5
14	1	5
15	1	5
16	1	5
17	2	6
18	2	6
19	2	6
20	2	6
21	3	6
22	3	6
23	3	6
24	3	6
25	4	6
26	4	7
27	4	7
28	4	7
29	4	7
30	6	7
31	6	8
32	6	8
33	6	8
34	6	8
35	6	8
36	6	8
37	6	8
38	6	8
39	6	8
40	8	8

(1) Test sample passing not permitted at this stage.

(2) Test sample failure not permitted at this stage.

Table 4—*Sample Plan for Code Letter "C"*

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	3
4	(1)	3
5	(1)	3
6	(1)	4
7	0	4
8	0	4
9	0	4
10	0	4
11	0	5
12	1	5
13	1	5
14	1	5
15	1	5
16	1	6
17	2	6
18	2	6
19	2	6
20	2	6
21	3	7
22	3	7
23	3	7
24	3	7
25	3	7
26	4	8
27	4	8
28	4	8
29	4	8
30	4	8
31	5	8
32	5	9
33	5	9
34	5	9
35	5	9
36	6	9
37	6	10
38	6	10
39	6	10
40	6	10
41	7	10
42	7	11
43	7	11
44	7	11
45	8	11
46	8	11
47	8	11
48	8	11
49	8	11
50	10	11

(1) Test sample passing not permitted at this stage.

(2) Test sample failure not permitted at this stage.

Table 5—*Sample Plan for Code Letter "D"*

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	3
4	(1)	3
5	(1)	3
6	(1)	4
7	0	4
8	0	4
9	0	4
10	0	4
11	0	5
12	1	5
13	1	5
14	1	5
15	1	5
16	1	6
17	2	6
18	2	6
19	2	6
20	2	6
21	2	7
22	3	7
23	3	7
24	3	7
25	3	7
26	3	8
27	4	8
28	4	8
29	4	8
30	4	8
31	4	9
32	5	9
33	5	9
34	5	9
35	5	9
36	6	10
37	6	10
38	6	10
39	6	10
40	6	11
41	7	11
42	7	11
43	7	11
44	7	11
45	7	12
46	8	12
47	8	12
48	8	12
49	8	12
50	8	13
51	9	13
52	9	13
53	9	13
54	9	13
55	9	13
56	10	13
57	10	13
58	10	13
59	10	13
60	12	13

(1) Test sample passing not permitted at this stage.

(2) Test sample failure not permitted at this stage.

24. A new Subpart N is added to Part 86 and reads as follows:

Subpart N—Emission Regulations For New Gasoline-Fueled and Diesel Heavy-Duty Engines; Gaseous Exhaust Test Procedures

Sec.

Authority: Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act; as amended, 42 U.S.C. 7521, 7524, 7541, 7542 and 7601.

Subpart N—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines; Gaseous Exhaust Test Procedures

§ 86.1301–84 Scope; applicability.

This subpart contains gaseous emission test procedures for gasoline-fueled and diesel heavy-duty engines. It applies to 1984 and later model years.

§ 86.1302–82 Definitions.

The definitions in § 86.084–2 apply to this subpart.

§ 86.1303–84 Abbreviations.

The abbreviations in § 86.084–3 apply to this subpart.

§ 86.1304–84 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section § 86.1311–84 applies to the 1984 and subsequent model years until superseded. If a section § 86.1311–88 is promulgated it would take effect beginning with the 1988 model year; § 86.1311–84 would apply to model years 1984 through 1987.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both gasoline-fueled and diesel heavy-duty engines.

§ 86.1305–84 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on gasoline-fueled and diesel heavy-duty engines. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1306–84 through 86.1315–84 set forth specifications and equipment requirements; §§ 86.1316–84 through 86.1326–84 discuss calibration methods and frequency; test procedures are listed in §§ 86.1327–84 through 86.1341–84; calculation formulas are found in § 86.1342–84; data requirements are found in § 86.1344–84.

§ 86.1306–84 Equipment required and specifications; overview.

(a) This subpart contains procedures for exhaust emissions tests on diesel or gasoline-fueled heavy-duty engines. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Diesel and gasoline-fueled engines are tested identically with the exception of hydrocarbon measurements; diesel engines require a heated hydrocarbon detector, § 86.1310–84. Necessary equipment and specifications appear in §§ 86.1308–84 through 86.1311–84.

(2) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing are specified in § 86.1313–84. Analytical gases are specified in § 86.1314–84. The EPA heavy-duty transient engines cycles for use in exhaust testing are described

in § 86.1333–84 and specified in Appendix I.

§ 86.1307–84 [Reserved]

§ 86.1308–84 Dynamometer and engine equipment specifications.

(a) *Engine dynamometer.* The engine dynamometer system must be capable of controlling engine torque and rpm simultaneously over transient cycles. The transient torque and rpm schedules described in § 86.1333–84 and specified Appendix I (f and g) must be followed within the accuracy requirements specified in § 86.1341–84. In addition, to these general requirements, the dynamometer read out and read out signals for speed and torque shall meet the following accuracy specifications:

(1) Engine speed shall be accurate to within 2 percent of point at all speeds.

(2) Engine torque at the flywheel shall be accruate to within 3 percent of point at all torque settings above 10 percent of full-scale of the torque measuring device. Below 10 percent of full-scale, the torque measuring device shall have an accuracy of:

(i) ±2.5 ft.-lbs., if the full scale value is 550 ft.-lbs. or less.

(ii) ±5 ft.-lbs., if the full scale value is 1050 ft.-lbs. or less.

(iii) ±10 ft.-lbs., if the full scale value is greater than 1050 ft.-lbs.

(3) *Option:* Internal dynamometer signals (i.e., armature current, etc.) may be used for torque measurement provided that it can be shown that the true engine flywheel torque during the test cycle conforms to the test cycle values as specified in § 86.1333–84, and if the technique is approved in advance by the Administrator. The minimum requirement for the Administrator's approval would include compensation for increased or decreased flywheel torque due to the armature inertia during accelerations and decelerations in the test cycle. Engineering data and comparison test results may be required.

(b) *Cycle verification equipment.* In order to verify that the test engine has followed the test cycle correctly, the dynamometer read out signals for speed and torque must be collected in a manner that allows a statistical correlation between the actual engine performance and the test cycle (See § 86.1341–84). Normally this collection process would involve conversion of analog dynamometer signals into digital values for storage in a computer. The conversion of dynamometer read out values into values (computer or other) that are used to evaluate the validity of engine performance in relation to the test cycle shall be performed in a manner such that:

(1) Speed values used for cycle evaluation are accurate to within 2 percent of the dynamometer speed read out value.

(2) Engine flywheel torque values used for cycle evaluation are accurate to within 3 percent of the dynamometer torque read out value.

(c) *Option:* For some systems it may be more convenient to combine the tolerances in paragraphs (a) and (b) of this section. This is permitted if the root mean square method (RMS) is used. The RMS values would then refer to accuracy in relationship to true value.

(1) Speed values used for cycle evaluation shall be accurate to within 2.8 percent of true value.

(2) Engine flywheel torque value used for cycle evaluation shall be accurate to within 4.2 percent of true value.

(d) *Speed calibration equipment.* A 60-tooth (or greater) wheel in combination with a common mode rejection frequency counter is considered an absolute standard for engine or dynamometer speed.

(e) *Torque calibration equipment.* Two techniques are allowed for torque calibration. Alternate techniques may be used if shown to be equivalent, and if prior approval is obtained from the Administrator.

(1) The lever-arm dead-weight technique involves the placement of known weights a known distance from the center of rotation of the torque measuring device. The equipment required are:

(i) *Calibration weights.* A minimum of 6 calibration weights for each range of torque measuring device used are required. The weights must be approximately equally spaced and each must be accurate to 0.5 percent of National Bureau of Standards weights. Laboratories located in foreign countries may certify calibration weights to local government bureau standards. Certification of weight accuracy by state government Bureau of Weights and Measures is acceptable. Effects of changes in gravitational constant at the test site may be accounted for if desired.

(ii) A lever arm with a minimum length of 24 inches. The distance from the center of the engine torque measurement device to the point of weight application shall be accurate to within 0.010 inches. The arm must be balanced or the hanging torque of the arm must be known within ±0.1 ft.-lbs.

(2) The transfer technique involves the use of a master load cell with a method of loading (usually hydraulic) the torque measuring device, or master unit that applies a known force to the torque measuring device based on piston area and pressure. The equipment required are:

(i) A master load cell or force application unit that must be calibrated at each test weight specified in paragraph (e)(1)(i) of this section with known weights traceable to within 0.1 percent of NBS weights. The provision on traceability in paragraph (e)(1)(i) apply to this section. The overall accuracy of the calibration curve of torque applied to the engine torque sensor as determined by the master units shall be within 0.5 percent of true value. Below 10 percent of full scale of the master unit the calibration curve of torque applied to the engine torque sensor shall be accurate to:

(A) ±0.5 ft.-lbs. of true value if full scale value is 550 ft.-lbs. or less.

(B) ±1.0 ft.-lbs. of true value if full scale value is 1050 ft.-lbs. or less.

(C) ±2.0 ft.-lbs. of true value if full scale value is greater than 1050 ft.-lbs.

(ii) A lever arm with a minimum length of 24 inches. The distance from the center of the engine torque measuring device to the point of force measurement or application shall be accurate to within 0.010 inches. The arm must be balanced or the hanging torque of the arm must be known within ±0.1 ft.-lbs.

(iii) Transfer of calibration or span from a dynomometer "case" torque value to the engine flywheel torque measuring device is permitted only under static or steady state conditions.

(3) Other techniques may be used if shown to be equivalent and if approved by the Administrator.

§ 86.1309–84 Exhaust gas sampling system; gasoline-fueled engines.

(a)(1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of engine exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied: the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period. The sampling and continuous analysis system specified in § 86.1310–84 for diesel engines may be used for testing gasoline-fueled engines if the systems meet all of the requirements for such systems as specified in this Subpart.

(2) *Positive displacement pump.* The positive displacement pump—constant volume sampler (PDP–CVS), Figure N83–1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total

volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional sample is achieved by sampling at a constant flow rate.

(3) *Critical flow venturi.* The operation of the critical flow venturi-constant volume sampler (CFV–CVS), Figure N84–2, is based upon the principles of fluid dynamics associated with critical flow. The CVF system is commonly called a constant volume - system (CVS) even though the flow varies. It would be more proper to call the critical flow venturi (CFV) system a constant proportion sampling system since proportional sampling throughout temperature excursions is maintained by use of a small CFV in the sample line. The variable mixture flow rate is maintained at sonic velocity, which is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at both venturi inlets, the sample volume is proportional to the total volume.

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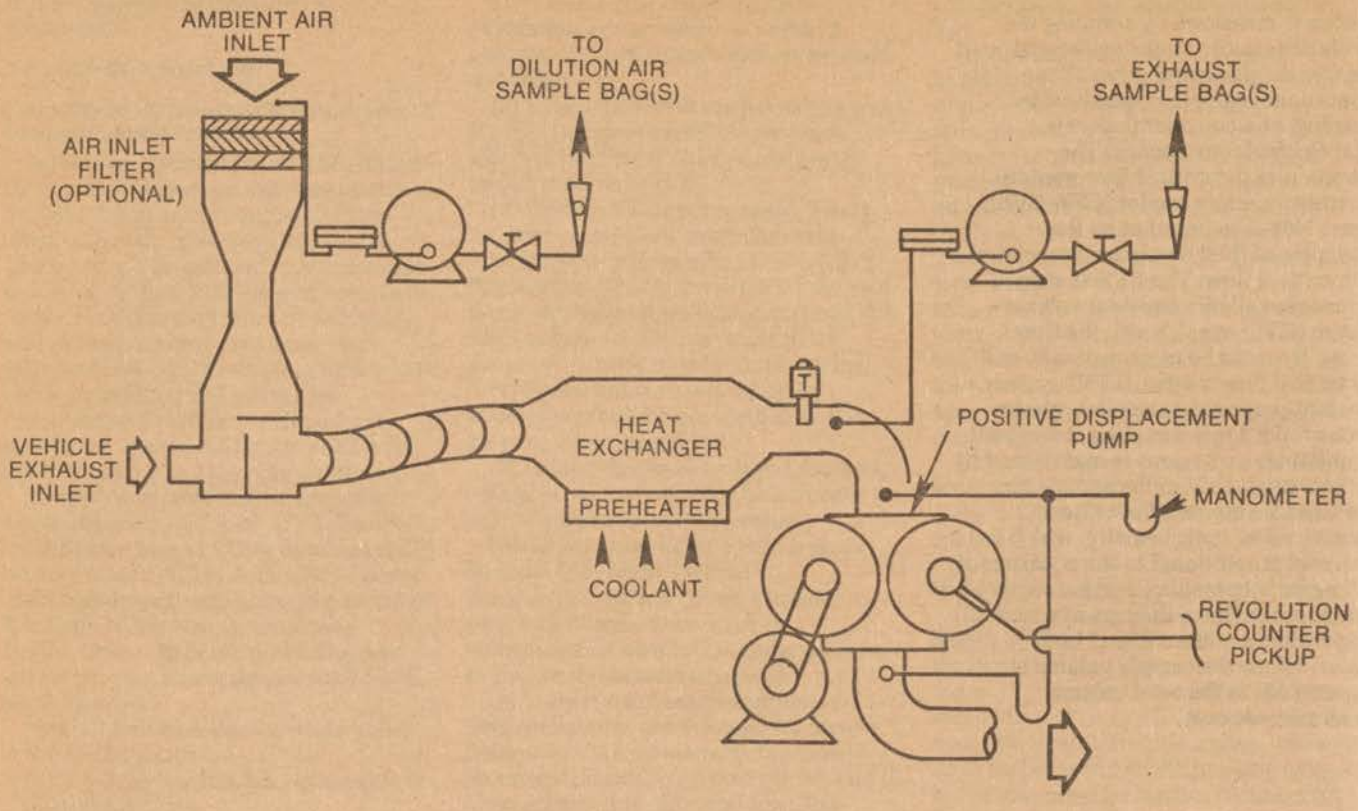
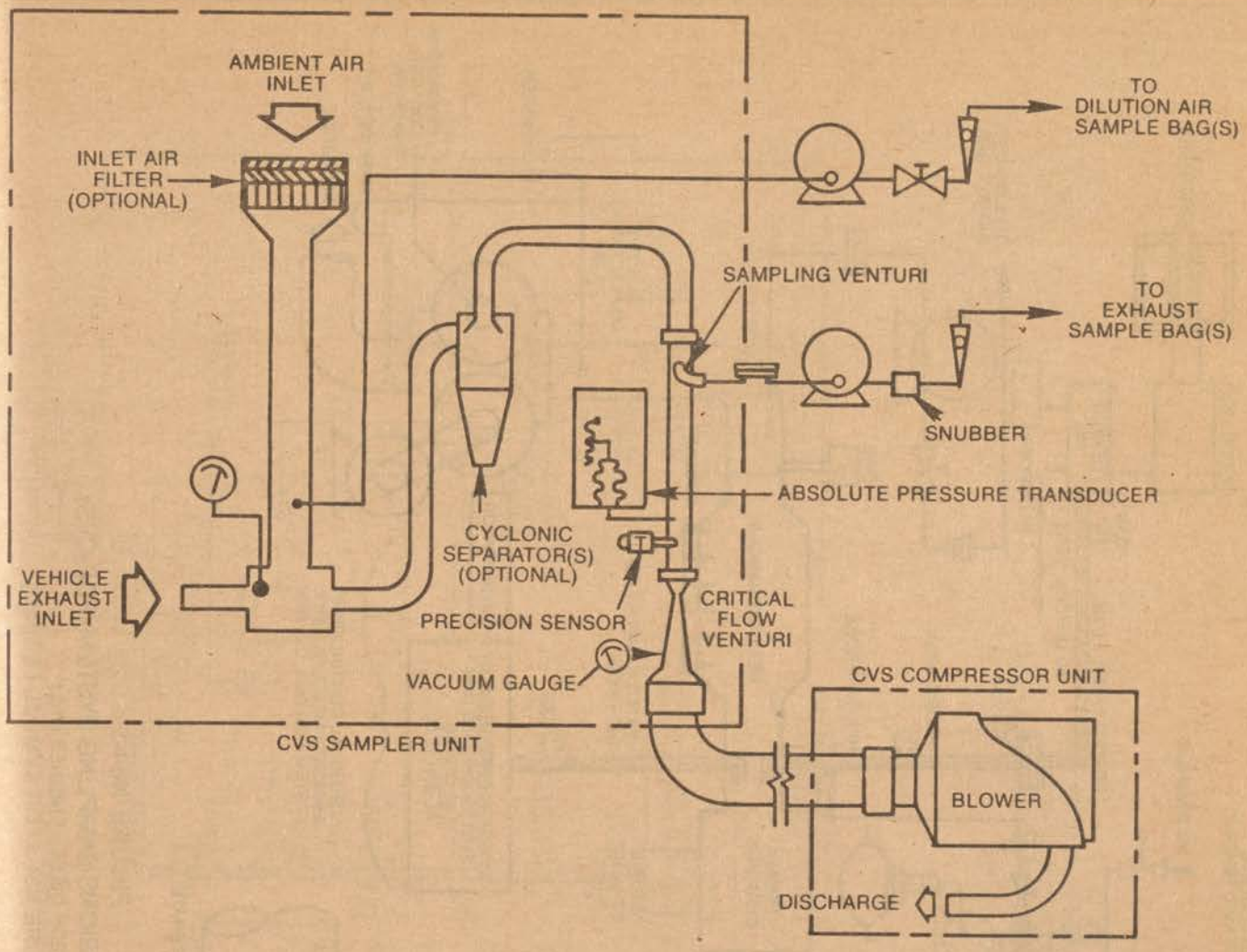


(SEE FIG. N84-5 FOR SYMBOL LEGEND)

FIGURE N84-1 — EXHAUST GAS SAMPLING SYSTEM PDP-CVS

FOR GASOLINE FUELED ENGINES



(SEE FIG. N84-5 FOR SYMBOL LEGEND)

FIGURE N84-2 — EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)
FOR GASOLINE FUELED ENGINES

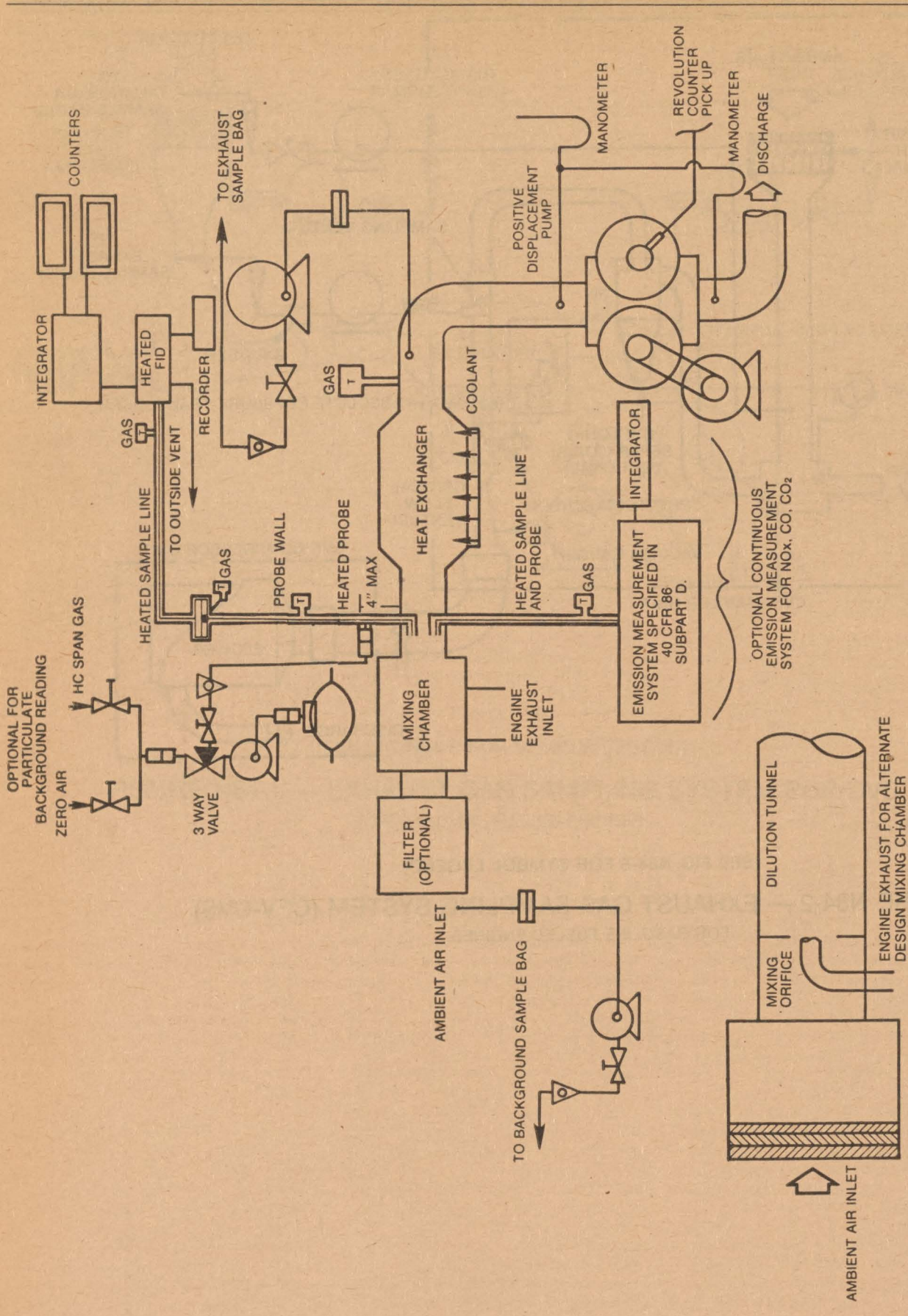


FIGURE N84-3
GASEOUS EMISSIONS SAMPLING SYSTEM (PDP-CVS)
(FOR DIESEL ENGINES ONLY)
(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

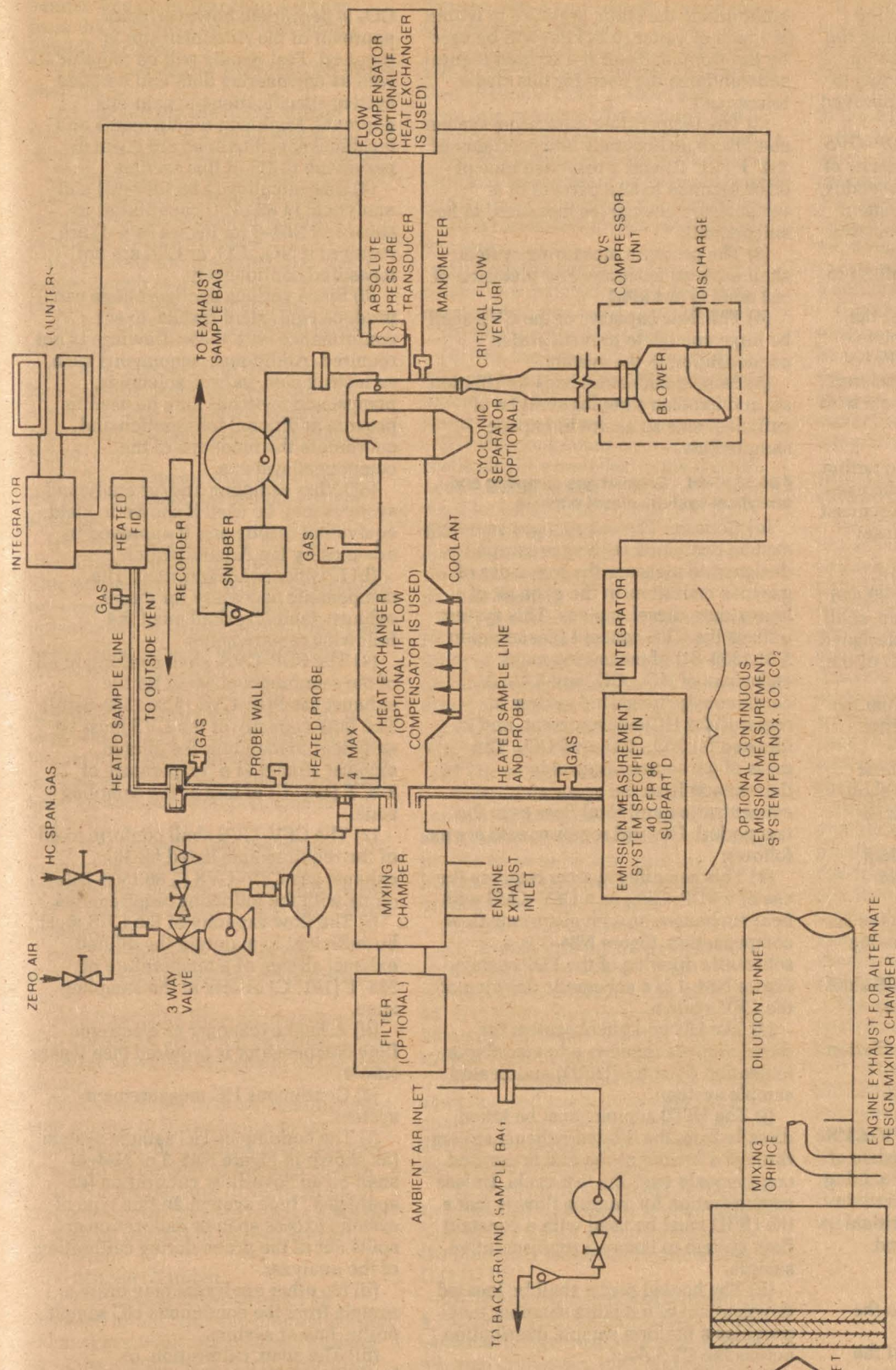


FIGURE N84-4

GASEOUS EMISSIONS SAMPLING SYSTEM (CFV-CVS)

(FOR DIESEL ENGINES ONLY)

(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

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(4) *Other systems.* Other sampling and/or analytical systems including the systems described in § 86.1310–84 for diesel engines may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(b) *Component description, PDP–CVS.* The PDP–CVS, Figure N84–1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP–CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the engine shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer engine cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±10° F (5.6° C) of the designed operating temperature at the start of the test. The designed operating temperature may be estimated from the average operating temperature from similar tests. The gas mixture temperature variation (after the heat exchanger) during the entire test shall be limited to ±10° F (5.6° C) from its value at the start of the test. The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C).

(3) The pressure gauges shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be sufficient size so as not to impede sample flow.

(c) *Component description, CFV–CVS.* The CFV–CVS, Figure N84–2 consists of a dilution air filter (optional) and mixing assembly, optional cyclonic particulate separator(s), sampling venturi, critical flow venturi, sampling system, and assorted valves, pressure and temperature sensors.

The CFV–CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer engine cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C) and a response time of 0.100 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to prevent water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

§ 86.1310–84 Exhaust gas sampling and analytical system; diesel engines.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of heavy-duty diesel engines. This system utilizes the CVS concept (described in § 86.1309–84) of measuring mass emissions of NO_x, CO, and CO_2. A continuously integrated system is required for HC measurement, and is allowed for NO_x, CO, and CO_2. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. General requirements are as follows:

(1) This sampling system requires the use of a PDP–CVS, or a CFV–CVS with heat exchanger or with electronic flow compensation. Figure N84–3 is a schematic drawing of the PDP system. Figure N84–4 is a schematic drawing of the CFV system.

(2) The HC analytical system for diesel engines requires a heated flame ionization detector (HFID) and heated sample system:

(i) The HFID sample must be taken directly from the diluted exhaust stream through a heated probe and integrated continuously over the test cycle. Unless compensation for varying flow is made, the HFID must be used with a constant flow system to insure a representative sample.

(ii) The heated probe shall be located downstream of a mixing chamber that provides a uniform sample distribution across the CVS duct.

(iii) A dilution tunnel similar to those used for diesel particulate sampling may be used as a mixing chamber.

(3) *Option:*

(i) Continuously integrated measurement of dilute NO_x, CO, and CO_2 is permitted; however, prior approval of the Administrator is required. Test results will be required as well as engineering data and detailed system specifications to gain this approval. Minimum requirements and technical specifications are given in paragraph (b)(5) of this section.

(4) Bag sampling (§ 86.1309–84) and analytical (§ 86.1311) capabilities as shown in N84–3 (or Figure N84–4) are required if NO_x, CO, or CO_2 are not measured continuously.

(5) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(6) Other sampling and/or analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) *Component description.* The components necessary for diesel exhaust sampling shall meet the following requirements:

(1) The PDP–CVS, shall conform to all of the requirements listed for the exhaust gas PDP–CVS (§ 86.1309–84(b)). The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 375° F (191° C) of less at the sampling zone.

(2) The CFV–CVS shall conform to all of the requirements listed for the exhaust gas CFV–CVS (§ 86.1309–84(c)), along with the following requirements.

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 375° F (191° C) or less at the sampling zone.

(ii) A heat exchanger or electronic flow compensator is required (see Figure N84–4).

(3) Continuous HC measurement system.

(i) The continuous HC sample system (as shown in Figure N84–3 or N84–4) shall be an "overflow calibration (or span) gas" type system. In this type of system, excess span or calibration gas spills out of the probe during calibration of the analyzer.

(ii) No other analyzers may draw a sample from the continuous HC sample probe, line or system.

(iii) The span, calibration, or background sample flow rates into the sample line shall be between 190 and 210 percent of the HFID analyzer flow rate.

(iv) The span, calibration or background gases shall enter the heated

sample line no farther than 4 inches from the CVS duct or dilution tunnel outside surface.

(v) The continuous hydrocarbon probe shall be:

(A) Installed in the dilute stream facing upstream at a point where the dilution air and exhaust are well mixed.

(B) Sufficiently distant (radially) from other probes so as to be free from the influence of any wakes or eddies produced by other probes.

(C) Heated and insulated over the engine length to maintain a 375°±20° F (191°±11° C) *wall* temperature.

(D) 0.5. in (1.27 cm) minimum inside diameter.

(E) It is intended that the total hydrocarbon probe be free from cold spots (i.e., free from spots where the probe wall temperature is less than 355° F (180° C)).

(vi) The dilute exhaust gas flowing in the total hydrocarbon sample system shall be:

(A) At 375°±10° F (191°±6° C) immediately before the heated filter. This *gas* temperature will be determined by a temperature sensor located immediately upstream of the filter. The sensor shall have an accuracy and precision of ±2° F (1.1° C).

(B) At 375°±10° F (191°±6° C) immediately before the HFID. This *gas* temperature will be determined by a temperature sensor located at the exit of the heated sample line. The sensor shall have an accuracy and precision of ±2° F (1.1° C).

(C) It is intended that the dilute exhaust gas flowing in the total hydrocarbon sample system be between 365° F and 385° F (185° C and 197° C) *gas* temperature.

(vii) The response time of the continuous measurement system shall be:

(A) 1.5 seconds from an instantaneous step change at the probe entrance to the analyzer to within 90 percent of the step change.

(B) 5.5. seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change.

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) Mixing chamber.

(i) The mixing chamber shall be designed to fully mix the dilution air and exhaust gas while minimizing HC hang up in the system between the entrance of the exhaust gas into the system and the HC sample probe.

(ii) A dilution tunnel similar to those used for diesel particulate testing may be used as a mixing chamber (See Figures N84–3 and N84–4). It shall have the following criteria:

(A) The tunnel shall be of sufficient size to permit development of turbulent flow (Reynold's No. >4000) and complete mixing of the exhaust and dilution air between a mixing orifice;

(B) The engine exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel;

(C) At least 18.0 inches (45.7 cm) in diameter;

(D) Constructed of electrically conductive material which does not react with the exhaust components;

(E) Electrically grounded;

(F) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation;

(G) The continuous hydrocarbon probe shall be installed in the dilution tunnel facing upstream at a point where the dilution air and exhaust are well mixed (i.e., approximately 10 tunnel diameters downstream of the point where the exhaust gas enters the dilution tunnel);

(H) All other factors of the continuous HC measurement system paragraph (b)(3) of this section, shall meet the requirement specified in this subpart for diesel HC measurement systems.

(5) Optional continuously integrated NO_x, CO, and CO_2 measurement system.

(i) The sample probe shall:

(A) Be in the same plane as the continuous HC probe, but shall be sufficiently distant (radially) from other probes so as to be free from the influences of any wakes or eddies produced by other probes.

(B) Shall face upstream.

(C) Heated and insulated over the entire length to prevent water condensation, minimum temperature is 55° C (131° F). Sample *gas* temperature immediately before the first filter in the system shall be at least 55° C (131° F).

(ii) The continuous NO_x, CO, or CO_2 sampling and analysis system shall conform to the specifications of 40 CFR Part 86, Subpart D with the following exceptions and revisions:

(A) The system components required to be heated by Subpart D need only be heated to prevent water condensation, the minimum temperature allowed is 55° C (131° F).

(B) The system response defined in § 86.329–79 shall be no greater than 5.5 seconds. Longer response time may be allowed if analysis system response time is coordinated with CVS flow fluctuations, is shown to be equivalent to the 5.5 second system, and if prior approval is granted by the Administrator.

(C) Alternative NO_x measurement techniques outlined in § 86.346–79 are not permitted for NO_x measurement in this Subpart.

(D) All analytical gases shall conform to the specifications of § 86.1314–84.

(E) Any range on a linear analyzer below 155 ppm shall have and use a calibration curve conforming to § 86.330–79.

(F) The measurement accuracy requirements specified in § 86.338–79 are superseded by those specified in § 86.1338–84.

(iii) The chart deflections of analyzers with non-linear calibration curves shall be converted to concentration values by the calibration curve(s) specified in Subpart D (§ 86.330–79) before flow correction (if used) and subsequent integration takes place.

§ 86.1311–84 Exhaust gas analytical system. CVS bag sample.

(a) *Schematic drawings.* Figure N84–5 is a schematic drawing of the exhaust gas analytical system used for analyzing CVS bag samples from either gasoline-fueled or diesel engines. Since various configurations can produce accurate results, exact conformance with the drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Major component description.* The analytical system, Figure N83–3, consists of a flame ionization detector (FID) for the determination of hydrocarbons , nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen.

The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used ge if shown to yield equivalent results and if approved in advance by the Administrator.

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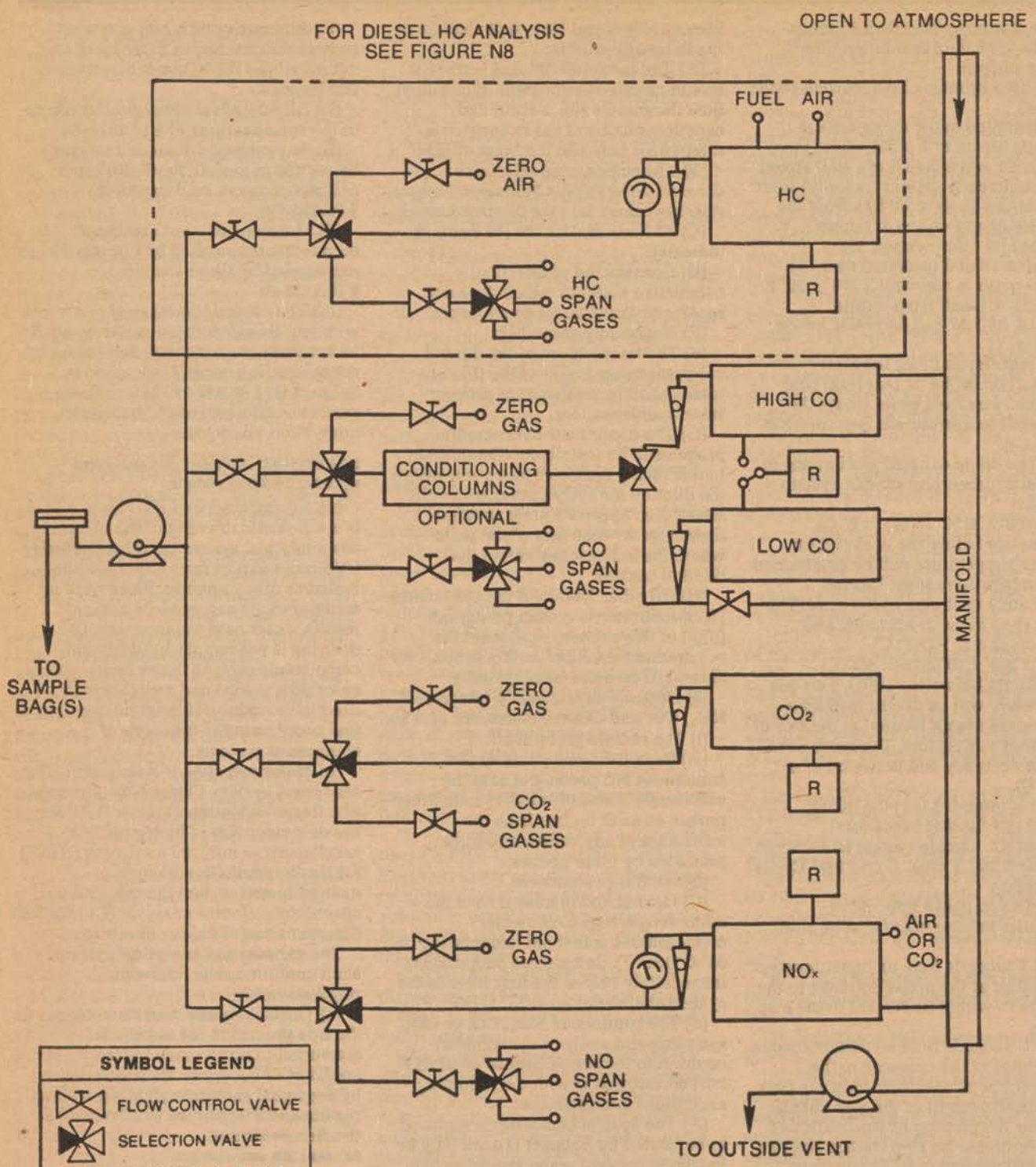

FIGURE N84-5 EXHAUST GAS ANALYTICAL SYSTEM

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(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments are used which are essentially free of CO_2 and water vapor interference, the use of the conditioning column may be deleted. (See § 86.1322–84 and § 86.1342–84.)

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale. (See § 86.1322–84.)

(c) *Alternate analytical systems.* Analysis systems meeting the specifications of 40 CFR 86, Subpart D may be used for testing this Subpart (N) with the exception of §§ 86.346–79 and 86.347–79, provided that the Subpart D systems meet the specifications of this Subpart. Heated analyzers may be used in their heated configuration.

(d) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

§ 86.1312–84 [Reserved]

§ 86.1313–84 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Adminstrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust testing, except that the lead and octane specifications do not apply.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded gasoline the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be not higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number. The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.084–21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1–D" or "Type 2–D" grade diesel fuel shall be used.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D" grade diesel fuel shall be used.

Item	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	98	93
Pb. (organic), gm/U.S. gallon		[1] 1.4	0.00–0.05
Distillation range:			
IBP, °F	D86	75–95	75–95
10 percent point, °F	D86	120–135	120–135
50 percent point, °F	D86	200–230	200–230
90 percent point, °F	D86	300–325	300–325
EP, °F (maximum)	D86	415	415
Sulphur, weight percent, (max)	D1266	0.10	0.10
Phosphorus, gm/U.S. gallon (max)		0.01	0.005
RVP, psi	D323	8.7–9.2	8.7–9.2
Hydrocarbon composition:			
Olefins, percent, (max)	D1319	10	10
Aeromatics, percent (max)	D1319	35	35
Saturates	D1319	[2]	[2]

[1] Minimum.
[2] Remainder.

Item	ASTM	Type 1–D	Type 2–D
Cetane	D613	48–54	42–50
Distillation range:			
IBP °F	D86	330–390	340–400
10 percent point, °F	D86	370–430	400–460
50 percent point, °F	D86	410–480	470–540
90 percent point, °F	D86	460–520	550–610
EP, °F	D86	500–560	580–660
Gravity, °API	D287	40–44	33–37
Total Sulfur, percent	D129 or D2622.	0.05–0.20	0.2–0.5
Hydrocarbon composition:			
Aromatics, percent	D1319	[1] 8	[1] 27
Parafins, Naphthenes, Olefins	D1319	[1]	[1]
Flashpoint, °F (minimum)	D93	120	130
Viscosity, Centistokes	D445	1.6–2.0	2.0–3.2

[1] Minimum.

Item	ASTM	Type 1–D	Type 2–D
Cetane (minimum)	D613	42–56	30–58
Distillation range:			
90 percent point, °F	D86	440–530	540–630
Gravity °APM	D287	39–45	30–42
Total sulfur, percent (minimum)	D129 or D2622.	[1] 0.05	0.2
Flashpoint, °F (minimum)	D93	120	130
Viscosity, centistokes	D455	1.2–2.2	1.5–4.5

[1] Minimum.

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided they are:

(i) Commercially available;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability;

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.084–21(b)(3).

§ 86.1314–84 Analytical gases.

(a) *Analyzer gases.*

(1) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2 respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for the NO_x analyzer shall be single blends of NO named as NO_x with a maximum NO_2 concentration of 5 percent of the nominal value using nitrogen as the diluent.

(4) Fuel for the FID shall be a blend of 40 ± 2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response. 98 to 100% hydrogen fuel may be used with advance approval of the Administrator.

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(6)(i) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(ii) Calibration gases shall be traceable to within 1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(iii) Span gases shall be accurate to within 2 percent of true concentration, where true concentration refers to NBS gas standards, or other gas standards which have been approved by the Administrator.

(7) The use of proportioning and precision blending devices to obtain the required gas concentrations is allowable provided their use has been approved in advance by the Administrator.

§ 86.1315–84 [Reserved]

§ 86.1316–84 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1318–84 through 86.1326–84.

(b) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, and oxides of nitrogen analyzer.

(2) Calibrate the engine dynamometer flywheel torque and speed measurement transducers.

(3) Calibrate the engine flywheel torque and speed feedback signals.

(c) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and;

(2) Perform a CVS system verification.

(d) The CVS positive displacement pump or critical flow venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.1319–84).

(e) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

§ 86.1317–84 [Reserved]

§ 86.1318–84 Engine dynamometer calibrations.

(a) The engine flywheel torque and engine speed measurement transducers shall be calibrated at least once each month with the calibration equipment described in § 86.1308–84.

(b) The engine flywheel torque and speed feedback signal shall be calibrated at least once each month.

(c) Other engine dynamometer system calibrations shall be performed as dictated by good engineering practice and manufacturer's recommendations.

(d) When calibrating the engine flywheel torque transducer, any lever arm used to convert a weight or a force through a distance into a torque shall be used in a horizontal position ($\pm 5°$).

(e) Calibrated resistors may not be used for engine flywheel torque transducer calibration, but may be used to span the transducer prior to engine testing.

§ 86.1319–84 CVS calibration.

(a) The CVS is calibrated using an accurate flowmeter and restrictor valve. The calibrated accuracy of the flowmeter shall be traceable to the National Bureau of Standards to within 1 percent of the true flow value.

Note.—In no case should an upstream screen or other restriction which can affect the flow be used ahead of the flowmeter unless calibrated throughout the flow range with such a device.

The CVS calibration procedures are designed for use of a "metering venturi" type flowmeter. Properly calibrated large radius or ASME flow nozzles are considered equivalent if traceable to NBS measurements. Other measurement systems may be used if shown to be equivalent under the test conditions in this action and if approved by the Administrator. Measurements of the various flowmeter parameters are recorded and related to flow through the CVS. Procedures used by EPA for both PDP- and CFV-CVS's are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator.

(b) After the calibration curve has been obtained, verification of the entire system may be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g. analyzer calibration or HC hangup. A verification procedure is found in paragraph (e) of this section.

(c) PDP calibration.

(1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump.

(i) All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump.

(ii) The calculated flow rate, $ft^3/min.$, (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters.

(iii) The linear equation which relates the pumpflow and the correlation function is then determined.

(iv) In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve:

(i) The pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. (Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressure, and therefore reflect the absolute pressure differentials.)

(ii) The temperature stability must be maintained during calibration. (Flowmeters are sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes in temperature are acceptable as long as they occur over a period of several minutes.)

(iii) All connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurment of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

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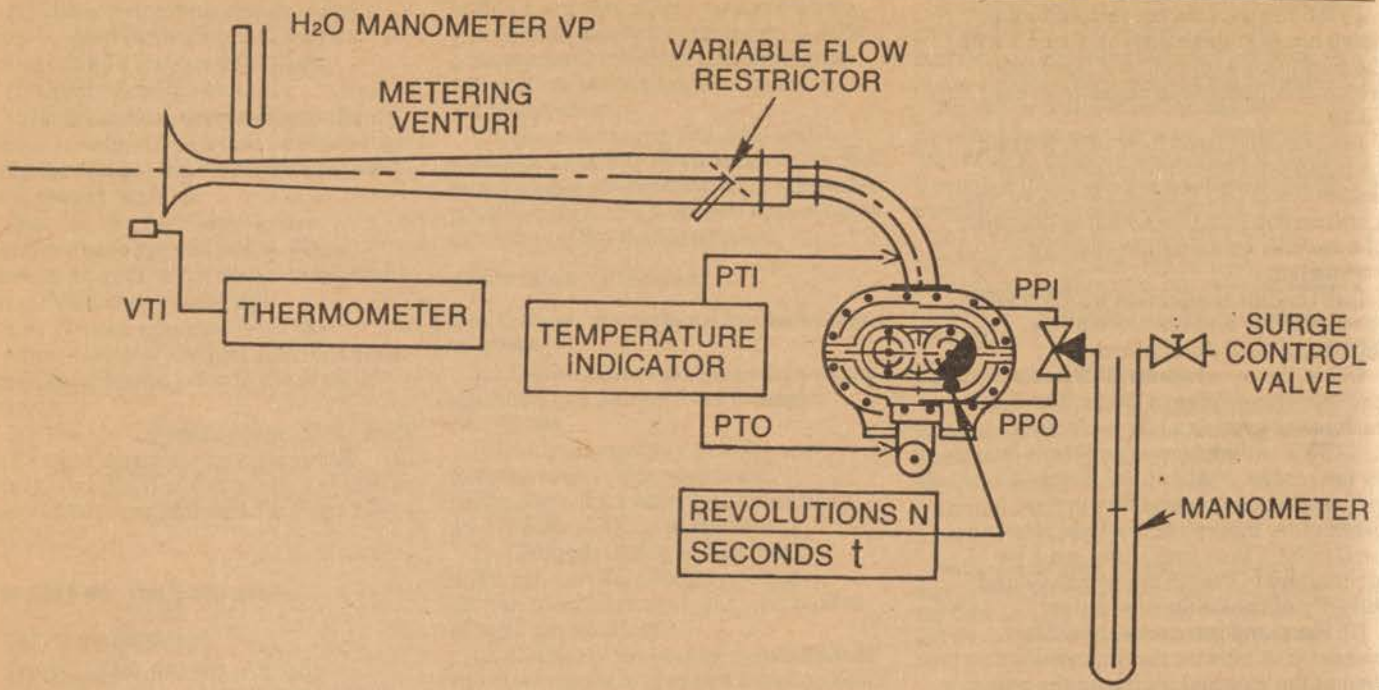

FIGURE N84-6 — PDP-CVS CALIBRATION CONFIGURATION

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(4) Connect a system as shown in Figure N84–6. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

Calibration Data Measurements

Parameter	Sym.	Units	Tolerances
Barometric pressure (corrected)	P_B	In. Hg (kPa)	±.01 in. Hg (±.034 kPa).
Ambient temperature	T_A	°F (°C)	±.5° F (±.28° C).
Air temperature into SFV	ETI	°F (°C)	±.50° F (±.26° C).
Pressure drop between SFV inlet and throat	EDP	In. H_2O (kPa)	±.05 in. H_2O (±.012 kPa).
Air temperature at CVS pump inlet	PTI	°F (°C)	±.5° F (±.28° C).
Pressure depression at CVS pump inlet	PPI	In. fluid (kPa)	±.05 in. fluid (±.022 kPa).
Specific gravity of manometer fluid (1.75 oil)	Sp. G		
Pressure head at CVS pump outlet	PPO	In. fluid (kPa)	±.05 in. fluid (±.022 kPa).
Air Temperature at CVS pump outlet (optional)	PTO	°F (°C)	±.5° F (±.28° C).
Pump revolutions during test period	N	Revs	±1 Rev.
Elapsed time for test period	t	s	±.05 s.

(5) After the system has been connected as shown in Figure N84–6, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) *Data analysis:*

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute (68° F, 29.92" HG) from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = \frac{Qs}{n} \times \frac{T_p}{528} \times \frac{29.92}{P_p}$$

Where:

V_o = Pump flow, ft^3/revolution (m^3/revolution) at T_p, P_p.
Qs = Meter air flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20°C, 101.3 kPa.)
n = Pump speed in revolutions per minute.
T_p = Pump inlet temperature R(K)
= PTI + 460 (°R), or
= PTI + 273 (°K).
P_p = Absolute pump inlet pressure, in. Hg (kPa)
= P_B − PPI (Sp. Gr./13.57) for SI units, $P_p = P_B - PPI$

Where:

P_B = barometric pressure, in. Hg (kPa).
PPI = Pump inlet depression, in. fluid (kPa).
Sp. Gr. = Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data.

$$X_o = \frac{1}{n}\sqrt{\frac{p_p}{P_e}}$$

Where:

x_o = correlation function.
Δp_p = The pressure differential from pump inlet to pump outlet, in. Hg (kPa).
= $P_e - P_p$
P_e = Absolute pump outlet pressure, in. Hg (kPa)
= P_B + PPO (Sp. Gr./13.57) for SI units, $P_e = P_B + PPO$

(b) *CFV calibration.* (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

Q_s = flow,
K_v = calibration coefficient,
P = absolute pressure,
T = absolute temperature.

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

Calibration Data Measurements

Parameter	Sym	Units	Tolerances
Barometric Pressure (corrected)	P_B	In. Hg (kPa)	±.01 in. Hg (±.034 kPa).
Air temperature, flowmeter	ETI	°F (°C)	±.50°F (±.28°C).
Pressure drop between SFV inlet and throat	EDP	In. H_2O (kPa)	±.05 in. H_2O (±.012 kPa).
Air flow	Q_s	Ft^3/min. (m^3/min.)	±.5%.
CFV inlet depression	PPI	In. fluid (kPa)	±.05 in. fluid (±.022 kPa).
Temperature at venturi inlet	T_v	°F (°C)	±.5°F (±.28°C).
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		

(4) Set up equipment as shown in Figure N84–7 and check for leaks. Any leaks between the flow measuring devices and the critical flow venturi will seriously affect the accuracy of the calibration.

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s\sqrt{T_v}}{P_v}$$

Where:

Q_s = Flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).
T_v = Temperature at venturi inlet, R(K).
P_v = Pressure at venturi inlet, mm Hg (kPa).
= P_B − PPI (Sp. Gr./13.57).
for SI units: $P_v = P_B - PPI$.

Where:

PPI = Venturi inlet pressure depression, in. fluid (kPa).
Sp. Gr. = Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi

inlet pressure. For sonic flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases. See Figure N84–8.

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v take corrective action.

(e) *CVS system verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous).

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

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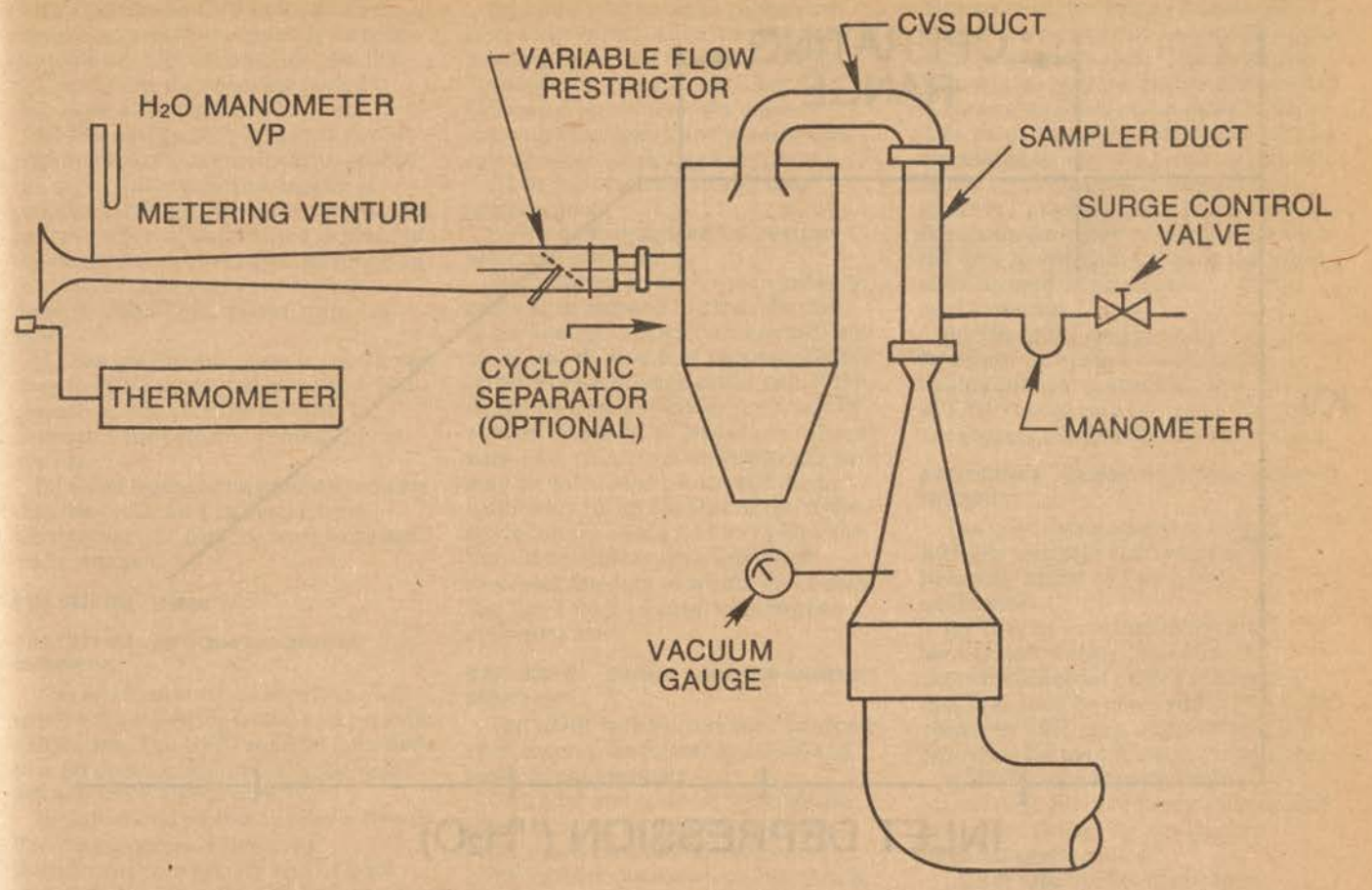

FIGURE N84-7 — CFV-CVS CALIBRATION CONFIGURATION

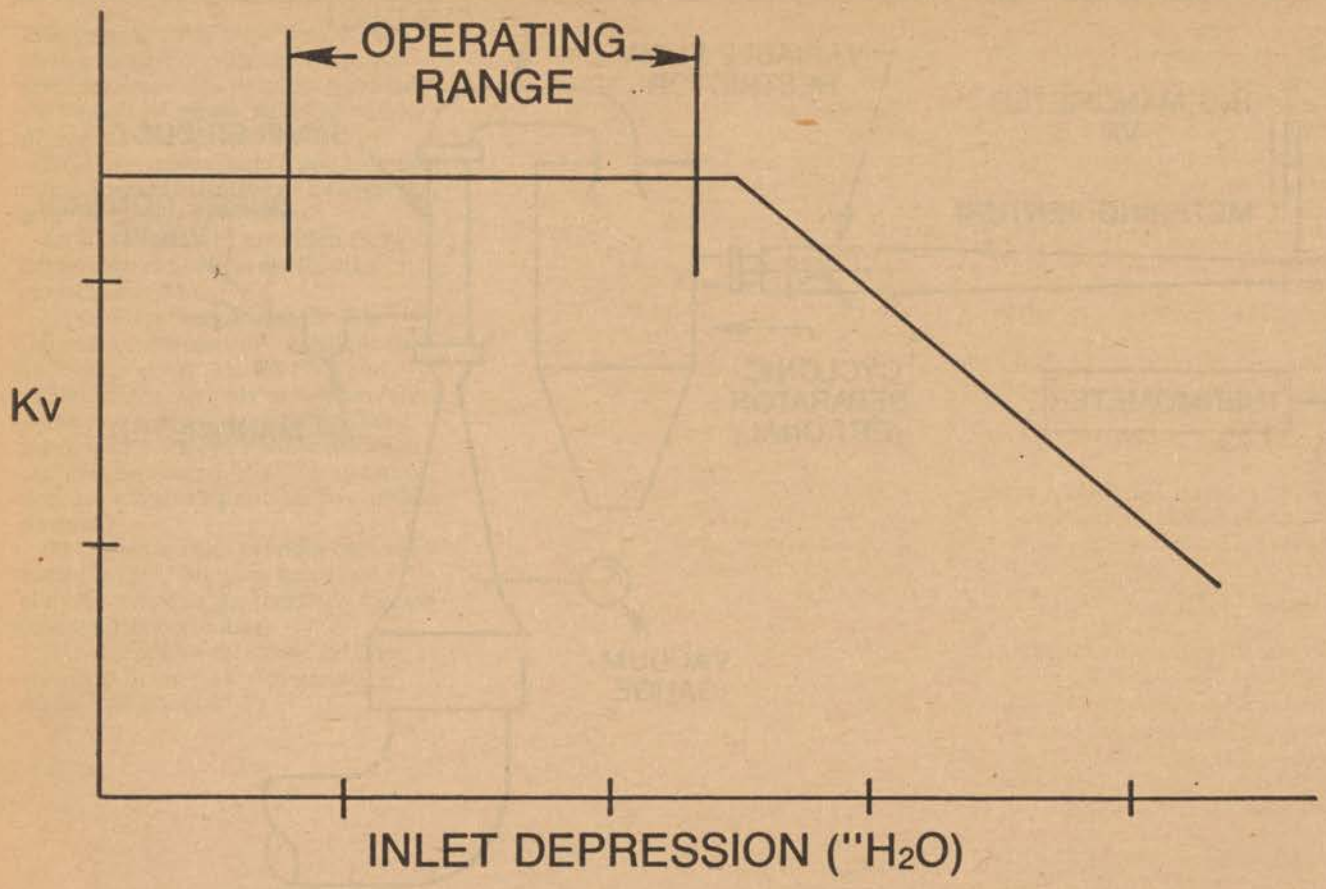

FIGURE N84-8— SONIC FLOW CHOKING

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(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.1342 are performed in the normal way except in the case of propane. The density of propane (17.56 g/ft³/carbon atom (0.6201 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 g/ft³ (1.164 kg/m³) is used.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) Good engineering practice requires that the cause for any discrepancy greater than ±2 percent must be found and corrected.

§ 86.1320–84 [Reserved]

§ 86.1321–84 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID shall be operated to a set point ±10°F (±5.5°C) between 365 and 385°F (185 and 197°C).

(a) Initial and periodic optimization of detector response. Prior to its introduction into service and at least annually thereafter the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions for initial instrument start-up and basic operating adjustment using the appropriate fuel (see § 86.1314–84 and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer, a propane in air mixture with a propane concentration equal to approximately 90% of the most common operating range.

(3) One of the following procedures is required for FID or HFID optimization.

(i) The procedures outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust"; author, Glenn D. Reschke.

(ii) The HFID optimization procedures outlined in 40 CFR Part 86, Subpart D.

(iii) Alternate procedures are allowed, if approved in advance by the Administrator.

(4) After the optimum flow rates have been determined, they are recorded for future reference.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the FID or HFID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each used operating range with propane in air calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2% or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2% at any point, the best-fit non-linear equation which represent the data to within 2% of each test point shall be used to determine concentration.

§ 86.1322–84 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibrations:

(a) Initial and periodic interference check. Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO_2:

(1) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Bubble a mixture of 3 percent CO_2 in N_2 through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each used operating range with carbon monoxide in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent of less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

(c) The initial and periodic interference, system check, and calibration test procedures specified in 40 CFR Part 86 may be used in lieu of the procedures specified in this section.

§ 86.1323–84 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

(a) Prior to its introduction into service and weekly thereafter the chemiluminescent oxides of nitrogen analyzer shall be checked for NO_2 to NO converter efficiency. Figure N84–9 is a reference for the following paragraphs:

(1) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Connect the outlet of the NO_x generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NO_x generator analyzer-system an NO in nitrogen (N_2) mixture with a NO concentration equal to approximately 80 percent of the most common operating range. The NO_2 content of the gas mixture shall be less than 5 percent of the NO concentration.

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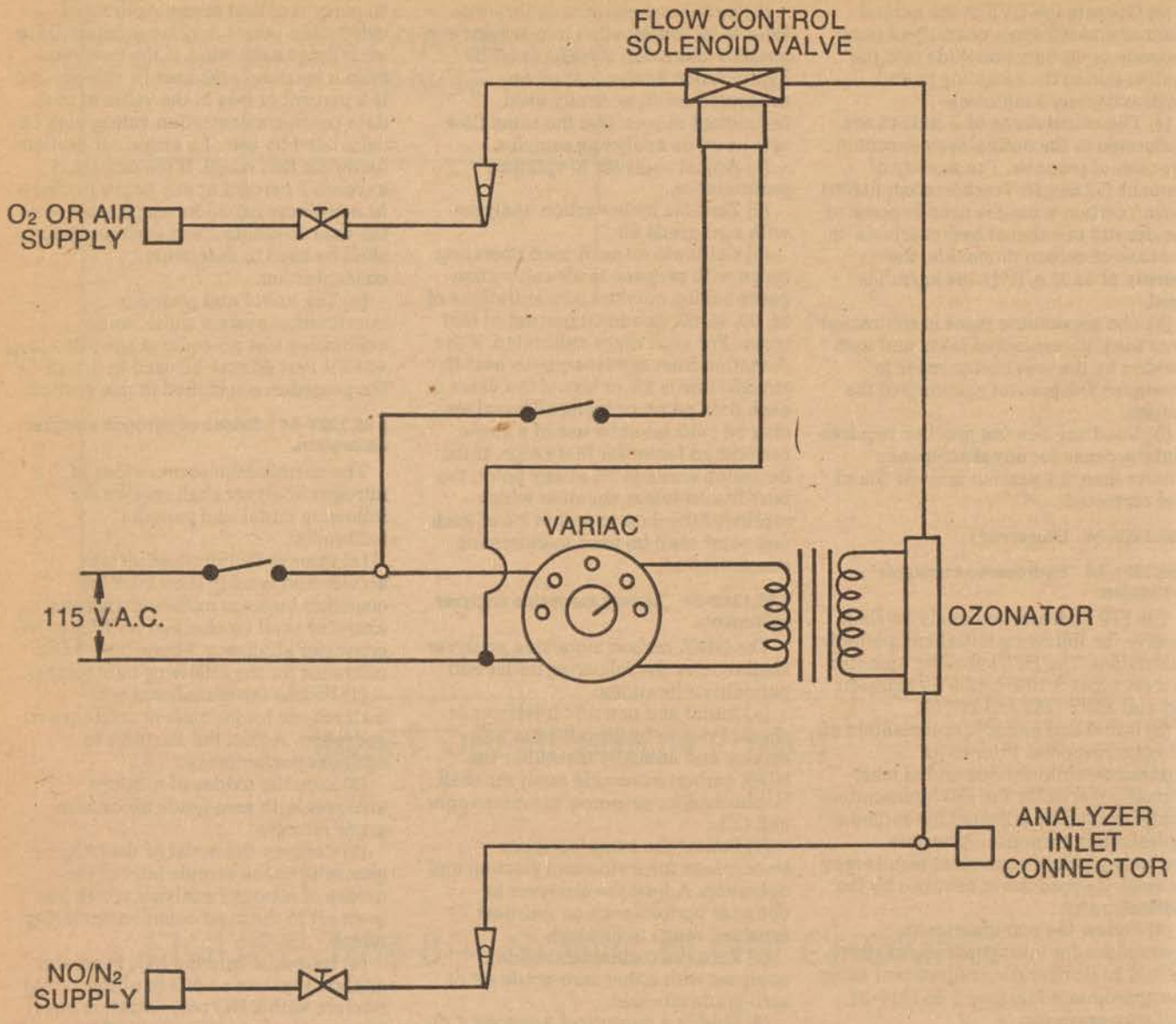

(SEE FIG. N84-5 FOR SYMBOL LEGEND)

FIGURE N84-9 — NO_x CONVERTER EFFICIENCY DETECTOR

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(5) With the oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NO_x generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in paragraph (a)(5) of this section. Record the concentration of NO in this $NO + O_2$ mixture.

(7) Switch the NO_x generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in paragraph (a)(5) of this section. There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NO_x mode and measure total NO_x. Record this value.

(9) Switch off the NO_x generator but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NO_x in the $NO + O_2$ mixture. Record this value.

(10) Turn of the NO_x generator O_2 (or air) supply. The analyzer will now indicate the NO_x in the original NO in N_2 mixture. This value should be no more than 5 percent above the value indicated in paragraph (a)(4) of this section.

(11) Calculate the efficiency of the NO_x converter by substituting the concentrations obtained into the following equation:

$$\text{Percent efficiency} = \left\{1 + \left(\frac{a-b}{c-d}\right)\right\} \times 100$$

Where:

a = concentration obtained in paragraph (a)(8),
b = concentration obtained in paragraph (a)(9),
c = concentration obtained in paragraph (a)(6),
d = concentration obtained in paragraph (a)(7).

If converter efficiency is not greater than 90% corrective action will be required.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO in N_2 calibration gases with nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2% or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2% at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

(c) The initial and periodic interferences, system check, and calibration test procedures specified in 40 CFR Part 86 may be used in lieu of the procedures specified in this section.

§ 86.1324-84 Carbon dioxide analyzer calibration.

Prior to its introduction into service and monthly thereafter the NDIR carbon dioxide analyzer shall be calibrated as follows:

(a) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance.

(b) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(c) Calibrate on each normally used operating range with carbon dioxide in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent of less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

(d) The initial and periodic interferences, system check, and calibration test procedures specified in 40 CFR Part 86 may used in lieu of the procedures in this section.

§ 86.1325-84 [Reserved]

§ 86.1326-84 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.1327-84 Engine dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen. The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in § 86.1334-84 and § 86.1335-84 respectively. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of Subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during the cold and hot start tests. The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x). A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals, the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1342-84, Calculations; exhaust emissions).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air cooled engines, the fan shall be installed.

(4) Additional accessories (e.g., oil cooler, alternators, air compressors, etc.) may be installed with advance approval by the Administrator.

(5) The engine must be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (e.g., intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer.

(f) *Exhaust system.* (1) A chassis-type exhaust system shall be used. The exhaust system shall meet the following requirements:

(i) For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data

showing equivalent performance at another location.

(ii) The exhaust back pressure or restriction shall be typical of those seen in the actual vehicle exhaust system configuration.

§§ 86.1328–84–86.1329–84 [Reserved]

§ 86.1330–84 Test sequence, general requirements.

(a) The test sequence shown in Figure N84–10 shows the major steps encountered as the test engine undergoes the procedures subsequently described.

(b) The average temperature of the engine intake air and CVS dilution air shall be maintained at 25° C±5° C (77° F±9° F) throughout the test sequence. Engines with auxiliary emission control devices which are temperature dependent (e.g., chokes, air cleaner, hot air doors, etc.) shall be tested at an average ambient test cell temperature of 25° C±5° C throughout the test sequence, except as noted in § 86.1335–84.

(c) No control of ambient or CVS dilution air humidity is required. Engine intake air humidity shall not exceed 90 grains of water per pound of dry air.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test, if applicable.

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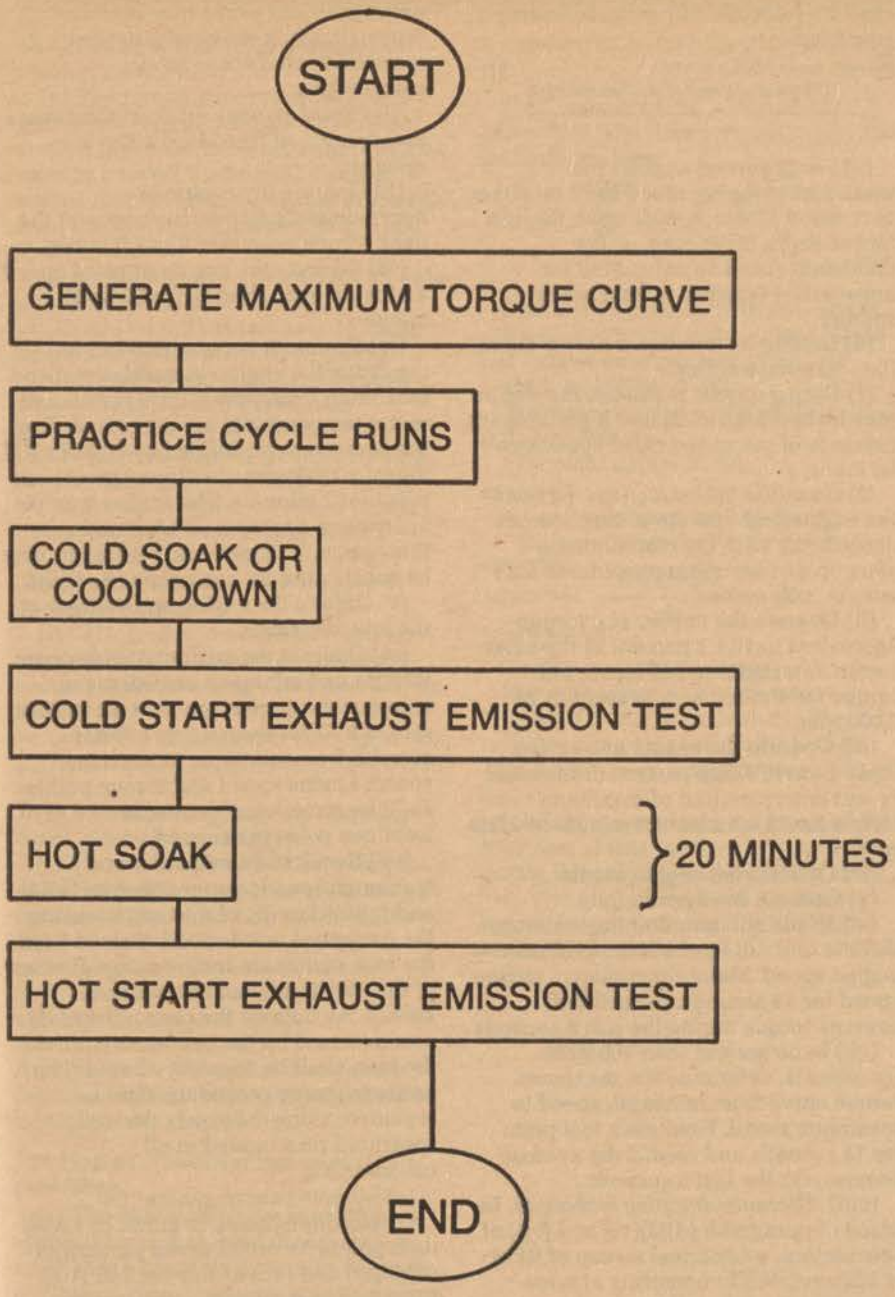

FIGURE N84-10— TEST SEQUENCE

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(e) The barometric pressure observed during the generation of the maximum torque curve shall not deviate more than 1 in. Hg from the value measured at the beginning of the map. The barometric pressure observed during the exhaust emission test shall not deviate more than 1 in. Hg from the value measured at the beginning of the emission test. The average barometric pressure observed during the exhaust emission test must be within 1 in. Hg of the average observed during the maximum torque curve generation.

(f) *Diesel Engines only.* Air inlet and exhaust restrictions shall be set to represent the average restrictions which would be seen in use in a representative application. Inlet depression and exhaust backpressure shall be set with the engine operating at maximum horsepower.

§ 86.1331-84 [Reserved]

§ 86.1332-84 Engine mapping procedures.

(a) Mount test engine on the engine dynamometer.

(b) Determine minimum mapping speed.

(1) *Gasoline-fueled engines.* The minimum mapping speed shall be calculated from the following equations:

(i) Minimum Speed = Curb Idle RPM − 200 RPM; or

(ii) Minimum Speed = 400 RPM, whichever is greater.

(2) *Diesel-engines.* The minimum mapping speed shall be calculated from the following equations:

(i) Minimum Speed = Low Idle RPM − 200 RPM; or

(ii) Minimum Speed = 400 RPM, whichever is greater.

(c) Determine maximum mapping speed.

(1) *Gasoline-fueled.* (i) For ungoverned engines the maximum mapping speed shall be calculated from the following equations:

$$\text{Maximum Speed} = \text{Curb Idle RPM} + \frac{115\ (\text{Measured rated RPM} - \text{Curb idle RPM})}{100}$$

(ii) For governed engines the maximum mapped speed shall be either that speed at which the wide open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines, whichever is smaller.

(2) *Diesel-engines.* (i) For ungoverned engines the maximum mapping speed shall be calculated from the following equation:

$$\text{Maximum Speed} = \text{Curb Idle RPM} + \frac{113\ (\text{Measured rated RPM} - \text{Curb idle RPM})}{100}$$

(ii) For governed engines the maximum mapping speed shall be either that speed at which wide open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines, whichever is smaller.

(d) Determine maximum torque curve (i.e., map the engine).

(1) During engine warm-up, the engine may be operated such that a preliminary estimate of measured rated speed can be made.

(2) *Gasoline-fueled engines.* (i) Start the engine and operate at zero load in accordance with the manufacturer's start-up and warm-up procedures for 1 minute ±30 seconds.

(ii) Operate the engine at a torque equivalent to 10±3 percent of the most recent determination of maximum torque for 4 minutes ±30 seconds at 2,000 rpm.

(iii) Operate the engine at a torque equivalent to 55±5 percent of the most recent determination of maximum torque for 35 minutes ±1 minute at 2,000 rpm.

(iv) Operate the engine at idle.

(v) Operate the throttle fully.

(vi) While still maintaining wide-open throttle and full-load obtain minimum engine speed. Maintain minimum engine speed for 15 seconds. Record the average torque during the last 5 seconds.

(vii) In no greater than 100 RPM increments, determine the maximum torque curve from minimum speed to maximum speed. Hold each test point for 15 seconds and record the average torque over the last 5 seconds.

(viii) *Alternate mapping technique.* In place of paragraph (d)(2)(vi) and (vii) of this section, a continual sweep of RPM is allowed. While operating at wide open throttle, the engine speed is increased at a constant 8 RPM/second (± 1 RPM/second) from minimum speed to maximum speed. Speed and torque points shall be recorded at a sample rate of at least one point per second.

(ix) Recalculate minimum and maximum speeds per paragraph (b)(1) and (c)(1)(i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If either of the new minimum or maximum speeds lay outside the range of speeds encompassed by the actual map, then the map shall be considered void. The entire mapping procedure shall be repeated, using the newly derived measured rated speed in all calculations.

(3) *Diesel engines.* (i) Start the engine and operate at free idle for 2 to 3 minutes.

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes.

(iii) Operate the engine at rated speed and wide open throttle for 25 to 30 minutes.

(iv) *Option.* It is permitted to pre-condition the engine at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes. The engine must be operated a minimum of 10 minutes for this option. This optional procedure may be substituted for paragraph (d)(3)(iii).

(v) Unload the engine and operate at the low idle speed.

(vi) Operate the engine at wide open throttle and minimum engine speed. Increase the engine speed at a constant rate of 8 RPM/second (± 1 RPM/second) from minimum to maximum speed. Engine speed and torque points shall be recorded at a sample rate of at least one point per second.

(vii) Recalculate minimum and maximum speeds per paragraphs (b)(2) and (c)(2)(i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If either of the new minimum or maximum speeds lay outside the range of speeds eccompassed by the actual map, then the map shall be considered void. The entire mapping procedure shall be repeated, using the newly derived measured rated speed in all calculations.

(e) Mapping curve generation.

(1) *Gasoline-fueled engines.* (i) Fit all data points recorded under paragraph (d)(2)(vi) and (vii) of this section (100 RPM increments) with a cubic spline technique.

(ii) All points generated under the continuous RPM sweep by paragraph (d)(2)(vi) and (viii) shall be connected by linear interpolation between points.

(iii) For governed engines, all points above the maximum speed (see paragraph (c)(1)(ii) of this section) shall be assigned maximum torgue values of zero for purposes of cycle generation.

(iv) For all engines, all speed points below 400 RPM shall be assigned a maximum torque value equal to that

observed at 400 RPM for purposes of cycle generation.

(v) The torque curve resulting from paragraph (c)(1)(i) through (iv) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (see Appendix I, f) to actual torque values for the test cycle.

(2) *Diesel-engines.* (i) Connect all data points recorded under paragraph (d)(3)(vi) and (vii) of this section using linear interpolation between points.

(ii) For governed engines, all points above the maximum speed (see paragraph (c)(2)(ii) of this section) shall be assigned maximum torque values of zero for purposes of cycle generation.

(iii) For all engines, all speed points below 400 RPM shall be assigned a maximum torque value equal to that observed at 400 RPM for purposes of cycle generation.

(iv) The torque curve resulting from paragraph (c)(2) (i) through (iii) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (see Appendix I, g) into actual torque values for the test cycle.

(f) Alternate mapping and mapping curve generation techniques.

(i) If a manufacturer believes that the above mapping techniques are unsafe or unrepresentative for any given engine or engine family, alternate mapping techniques may be used. Alternate techniques may be used only if approved in advance by the Administrator, and only if the Administrator judges the change to be justified, and the alternate procedure to be technically correct.

§ 86.1333–84 Transient test cycle generation.

(a) The heavy-duty transient engine cycles for gasoline- and diesel-fueled engines are listed in Appendix I (f and g). These second-by-second listings are designed to represent transient torque and RPM maneuvers characteristic of heavy-duty vehicles. Both RPM and torque are normalized in these listings.

(i) To unnormalize RPM use the following equation:

$$\text{Actual RPM} = \frac{\%\text{RPM (Measured rated RPM} - \text{Curb idle RPM)}}{100} + \text{Curb idle RPM}$$

(Curb idle for diesel engines is defined as the low idle RPM.)

(ii) Torque is normalized to the maximum torque at the RPM listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in § 86.1332–84.

(b) *Example of the unnormalization procedure. The following test point shall be unnormalized:*

%RPM	% Torque
43	82

The test engines have these values:

Measured Rated RPM = 3800 (Does not appear on given torque curve.)

Curb Idle RPM = 600.

Maximum torque curve as illustrated in Figure N84–11.

Calculate actual RPM:

$$\text{Actual RPM} = \frac{\%\text{RPM (measured rated RPM} - \text{idle RPM)}}{100} + \text{idle RPM}$$

$$\text{Actual RPM} = \frac{43\,(3800-600)}{100} + 600$$

$$\text{Actual RPM} = 1976$$

Determine actual torque:

Determine the maximum torque at 1976 RPM from Figure N84–11. Then multiply this value (358 ft-lb) by 0.82. This results in an actual torque of 294 ft-lbs.

(c) Engine speed and torque shall be recorded at least once every second during the cold start test and hot start test. The torque and RPM feedback signals may be electrically filtered.

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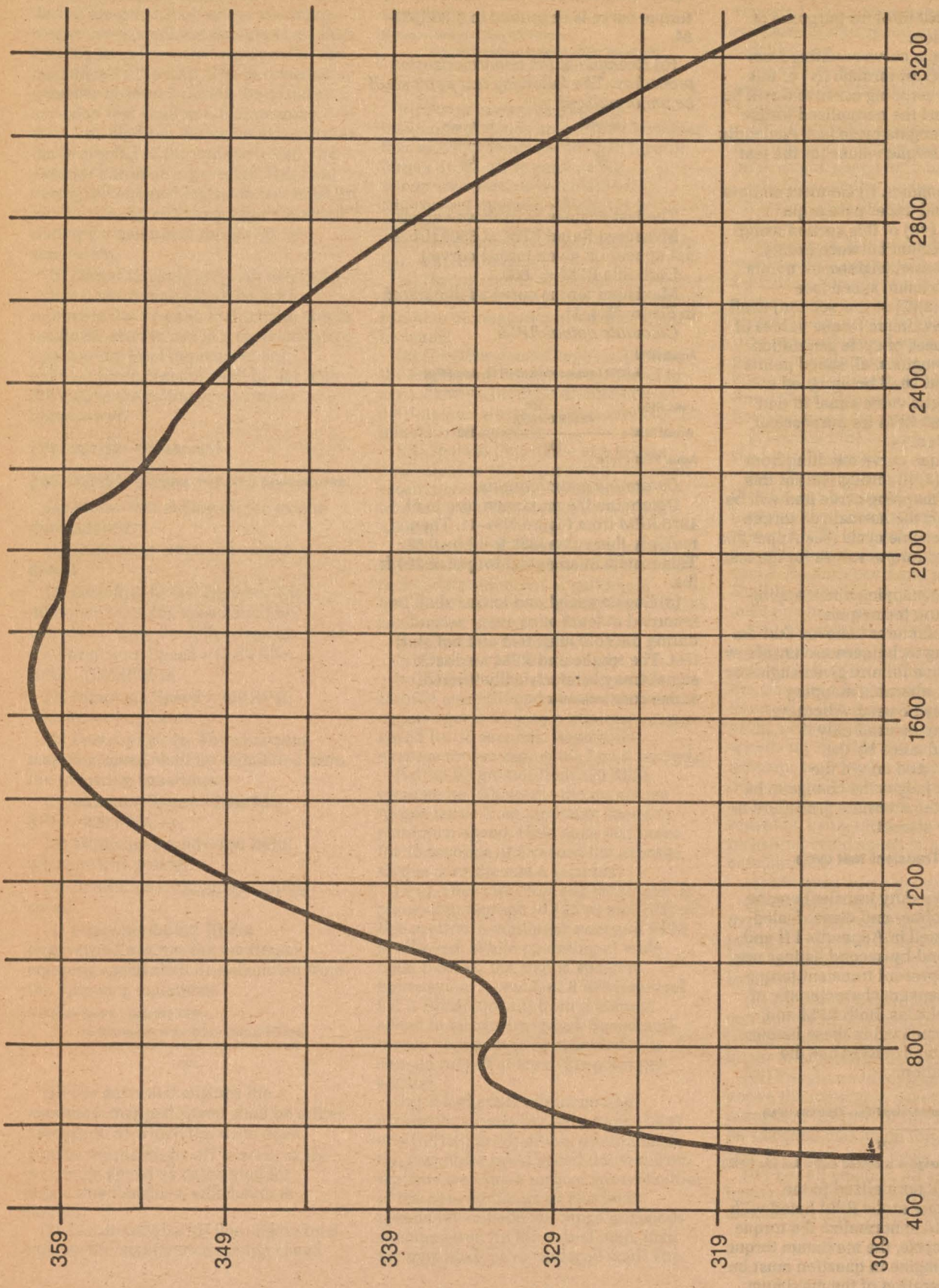

FIGURE N84-11 — SAMPLE MAXIMUM TORQUE CURVE FOR A GASOLINE-FUELED ENGINE.

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(d) *Gasoline-fueled engines.* The zero percent speed specified in the gasoline-fueled engine cycle (Appendix I (f)) shall be superseded by proper operation of the engine's automatic choke.

(1) During automatic choke operation a manual transmission engine shall be allowed to idle at whatever speed is required to produce a feedback torque of 0 ft-lbs ± 10 ft-lbs (using for example clutch disengagement, speed to torque control switching, software overrides, etc.) at those points in Appendix I where both reference speed and reference torque are zero percent values.

(2) During automatic choke operation an automatic transmission engine shall be allowed to idle at whatever speed is required to produce a feedback torque of CITT ft-lbs ± 10 ft-lbs (see (e)(2) of this section for definition of CITT) at those points in Appendix I where both reference speed and reference torque are zero percent values.

(3) This automatic choke high idle allowance is permitted only for the first 150 seconds of the cold cycle and the first 30 seconds of the hot cycle, after which the cycles shall be run as specified in Appendix I (f). (See 86.1341–84 for allowances in the cycle validation criteria.)

(e) *Automatic Transmissions.* The reference cycles Appendix I (f and g) shall be altered for engines intended for use with automatic transmissions.

(1) Zero percent speed for automatic transmission engines is defined as curb idle RPM, i.e., in-vehicle, coupled with automatic transmission in gear.

(2) All zero-percent speed, zero-percent torque points (idle points) shall be modified to zero percent speed, *x* percent torque. Using the manufacturers' specified curb idle transmission torque (CITT), the maximum torque available at the curb idle (i.e., with transmission) RPM as determined from the maximum torque curve generated in § 86.1332–84 *x* percent torque is defined per the following equation:

$$x\% = \frac{CITT \times 100}{\text{Maximum torque at curb idle RPM}}$$

§ 86.1334–84 Pre-test engine and dynamometer preparation.

(a) *Control system calibration.* (1) Before the cold soak or cool down, final calibration of the dynamometer and throttle control systems may be performed. These calibrations may consist of steady-state operation and/or actual practice cycle runs, but emissions may not be measured.

(2) Following any practice runs or calibration procedures, the engine shall be turned off and allowed to either cold soak at 60° to 86° F for a minimum of 12 hours, or be cooled per § 86.1335–84.

§ 86.1335–84 Optional forced cool-down procedure.

(a) This forced cool-down procedure applies to both gasoline and diesel-fueled engines.

(b) No substances or fluids may be applied to the engines internal or external surfaces except for water and air, and only as prescribed in paragraph (c) and (d) of this section.

(c) For water-cooled engines two types of cooling are permitted.

(1) Water may be circulated through the engine's water coolant system.

(i) The cooling water may be flowed in either direction and at any desired flow rate. The thermostat may be removed or blocked open during the cool down but must be restored before the exhaust emissions test begins.

(ii) The temperature of the circulated or injected water shall be between 10° C (50° F) and 30° C (86° F).

(iii) No fluid except water and no fluid or substance in solution with water is permitted. This does not preclude the use of a building's standard water supply for forced cool-down purposes.

(2) Flows of air may be directed at the exterior of the engine.

(i) Air shall be directed uniformly over the entire exterior surface of the engine at any desired flow rate.

(ii) The temperature of the cooling air shall not exceed 30° C (86° F). This is the only occasion when test cell ambient air temperature may deviate from the general specifications set forth in § 86.1330–84(b), i.e., may be less than 20° C (68° F).

(d) For air-cooled engines only cooling as prescribed in paragraph (c)(2) of this section is permitted.

(e) The cold cycle exhaust emission test may begin after a forced cool down only when the engine oil temperature as measured at the dipstick is between 20° C and 24° C (68° F and 75° F). No engine oil change is permitted during the test sequence, nor is any direct or indirect cooling of engine oil permitted except by natural conduction and convection associated with the procedures in paragraph (c) and (d) of this section.

(f) The cold cycle exhaust emission test for gasoline engines equipped with catalytic converters may begin after a forced cool down only when the catalyst bed temperature at the catalyst outlet is 25° C ± 5° C (77° F ± 9° F), in addition to the temperature restriction in paragraph (e) of this section.

(1) Catalyst cool down may be accomplished in whatever manner and using whatever coolant deemed appropriate by proper engineering judgment. The catalyst, engine, and exhaust piping configurations shall not be separated, altered, or moved in any way during the cool down.

(g) At the completion of the forced cool down, all general requirements specified in § 86.1330–84 and the oil temperature specification set forth in paragraph (e) of this section must be met before the cold cycle exhaust emission test may begin.

§ 86.1336–84 Engine starting and restarting.

(a) *Gasoline-fueled engines.* This paragraph applies to gasoline-fueled engines only.

(1) The engine shall be started with a production engine starter motor according to the manufacturer's recommended starting procedures in the owner's manual. The 24±1 second free idle period shall begin when the engine starts.

(2) *Choke operation:* (i) Engines equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(ii) Engines equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The operator may use the choke, throttle, etc. where necessary to keep the engine running.

(4) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic- and manual-choke engines) shall be started by depressing the throttle half way and cranking the engine until it starts.

(b) *Diesel engines.* The engine shall be started with a production engine starting-motor according to the manufacturer's recommended starting procedures in the owner's manual. The 24±1 second free idle period shall begin when the engine starts.

(c)(1) If the engine does not start after 15 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device (or revolution counter) on the constant volume sampler (and the hydrocarbon integrator when testing diesel vehicles, see § 86.1337, Engine dynamometer test run) shall be turned off during this diagnostic period. In addition, either the CVS should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the engine shall be rescheduled for testing from a cold start.

(2) If longer cranking times are recommended to the ultimate purchaser, such cranking times may be used provided the owner's manual and the service repair manual indicate the longer cranking times are normal, and if the use of the longer cranking times is approved in advance by the Administrator.

(3) If a failure to start occurs during the cold portion of the test and is caused by an engine malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.084–25), and the test continued. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the timing sequence shall begin. If failure to start is caused by engine malfunction and the engine cannot be started, the test shall be voided and corrective action may be taken according to § 86.084–25. The reasons for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(4) If a failure to start occurs during the hot start portion of the test and is caused by engine malfunction, the engine must be started within one minute of key on. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the transient engine cycle timing sequence shall begin. If the engine cannot be started within one minute of key on, the test shall be voided, corrective action taken (according to § 86.084–25), and the engine rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(d) If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(e) *Engine stalling.* (1) If the engine stalls during the initial idle period of either the cold or hot start test, the engine shall be restarted immediately using the appropriate cold or hot starting procedure and the test continued. If the engine cannot be started before the first non-idle record of the cycle, the test shall be voided.

(2) If the engine stalls anywhere in the cold cycle, except in the initial idle period, the test shall be voided.

(3) If the engine stalls on the hot cycle portion of the test at any time up to and including 580 seconds into the hot cycle, the engine may be shut off and resoaked for 20 minutes. The hot cycle may then be rerun. Any stalling of the engine or voiding of the hot cycle more than 580 seconds into the hot cycle shall result in a void test. Only one hot start resoak and restart is permitted.

§ 86.1337–84 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, dynamometer, and sampling system for the cold start test. Change filters, etc. and leak check as necessary.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan(s) and any data collection system (i.e., chart recorders, computers, data loggers, etc). The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their respective operating termperatures before the test begins. See § 86.1304–84(e) for continuous sampling procedures.

(4) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

Note.—CFV–CVS sample flow rate is fixed by the venturi design.

(5) Attach the CVS flexible exhaust tube to engine tailpipe(s).

(6) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and continuous NO_x, CO, or CO_2 (if used) analyzer(s) system integrator(s) and indicate the start of the test on the data collection medium (i.e., mark the chart on a chart recorder, set a byte on a computer or data logger, etc.).

(7) As soon as it is determined that the engine is started, start a "free idle" timer.

(8) Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in neutral or park. All other idle conditions shall be interpreted as an idle speed in gear. It is permissible to lug the engine down to curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(9) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds.

(10) On the last record of the cycle cease sampling, immediately turn the engine off, and start a hot soak timer.

(11) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower. As soon as possible transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 83.1340–84 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(12) Allow the engine to soak for 20±1 minutes.

(13) Prepare the engine and dynamometer for the hot start test.

(14) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(15) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan(s) and any data collection system (i.e., chart recorders, computers, data loggers, etc.). The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their respective operating temperatures before the test begins. See § 86.1340–84(e) for continuous sampling procedures.

(16) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

Note.—CFV–CVS sample flow rate is fixed by the venturi design.

(17) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling.

(18) As soon as it is determined that the engine is started, start a "free idle" timer.

(19) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(8) of this section apply.

(20) Begin the transient engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(21) On the last record of the cycle cease sampling.

(22) As soon as possible transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340–84 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(23) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold start portion and one for the hot start portion. It is permissible to use 4 sample bags per test portion. The bags shall sample for the portion of the cycle as indicated below:

	Sample time	
	Gasoline fueled	Diesel
Bag No.:		
1	272	297
2	579	597
3	895	902
4	1,167	1,199

§ 86.1338-84 Emission measurement accuracy.

(a) Measurement accuracy for analysis systems used for bag measurements.

(1) Good engineering practice would dictate that analyzer readings below 15 percent of full scale chart deflection should generally not be used.

(2) Some high resolution read-out systems such as computers, data loggers, etc., can provide sufficient accuracy and resolution below 15 percent of full scale. Such systems may be used provided that additional calibration bottles are added to insure that the calibration curves below 15 percent of full scale, in the region of the sample measurements, conforms to the accuracy specifications in § 86.1316–84 through § 86.1326–84.

(b) Measurement accuracy for analysis systems used for continuous measurement systems.

(1) Analyzers used for continuous analysis must be operated such that the integrated concentration value over the test cycle falls between 15 and 100 percent of full scale chart deflection. Exceptions to these limits are:

(i) If automatic range change circuitry is used and the limits for range changes are between 15 and 100 percent of full-scale chart deflection; or

(ii) Alternative paragraph (a)(2) of this section is used to insure that the accuracy of the calibration curve is maintained below 15 percent. In addition,

(iii) The analyzer's response may be less than 15 percent of full scale if the full-scale value is 155 ppmC or less.

(iv) The analyzer's response may be less than 15 percent of full scale if the emissions from the engine are erratic and the integrated chart deflection value is greater than 15 percent of full scale.

(v) The analyzer's response may be less than 15 percent of full scale if the contribution of all data read below the 15 percent level is less than 10 percent by mass of the final test results, and

(vi) During engine start-up the HC analyzer is allowed to "spike" off-scale for a maximum of 5 seconds.

§ 86.1339-84 [Reserved]

§ 86.1340 Exhaust sample analysis.

(a) The analyzer response may be read by automatic data collection (ADC) equipment such as computers, data loggers, etc. If ADC equipment is used the following is required.

(1) For bag analysis the analyzer response must be stable at greater than 99 percent of final reading. A single value representing the average chart deflection over a 10 second stabilized period may be stored.

(2) For continuous analysis systems, the ADC system must store at least 5 chart deflection readings per second.

(3) The chart deflections in paragraphs (a) (1) and (2) of this section may be stored on long term computer storage devices such as computer tapes, storage discs, punch cards, or they may be printed in a listing for storage. In either case a chart recorder is not required and records from a chart recorder, if they exist, need not be stored.

(4) If the data from ADC equipment is used as permanent records, the ADC equipment and the analyzer values as interpreted by the ADC equipment are subject to the calibration specifications in §§ 86.1316–84 through 86.1326–84, as if the ADC equipment were part of the analyzer.

(b) Data records from any one or a combination of analyzers may be stored as chart recorder records.

(c) Software zero and span.

(i) The use of "software" zero and span is permitted. The process of software zero and span refers to the technique of initially adjusting the analyzer zero and span responses to the calibration curve values, but for subsequent zero and span checks the analyzer response is simply recorded without adjusting the analyzer gain. The observed analyzer response recorded from the subsequent check is mathematically corrected back to the calibration curve values for zero and span. The same mathematical correction is then applied to the analyzer's response to a sample of exhaust gas in order to compute the true sample concentration.

(ii) The maximum amount of software zero and span mathematical correction is ±10 percent of full scale chart deflection.

(iii) Software zero and span may be used to switch between ranges without adjusting the gain of the analyzer.

(iv) The software zero and span technique may not be used to mask analyzer drift. The observed chart deflection before and after a given time period or event shall be used for computing the drift. Software zero and span may be used after the drift has been computed to mathematically adjust any span drift so that the "after" span check may be transformed into the "before" span check for the next segment.

(d) For bag sample analysis perform the following sequence:

(1) Warm up and stablize the analyzers.

(2) Clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(3) The order of paragraphs (d) (1) and (2) of this section may be interchanged.

(4) Obtain a stable zero reading.

(5) Zero and span the analyzers with zero and span gases. The span gases shall have concentrations between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures during spanning shall be approximately the same as those encountered during sampling.

(6) Re-check zero response, repeat paragraphs (d) (4) and (5) of this section or use software zero and span if necessary.

(7) If a chart recorder is used, identify the most recent zero and span response as the pre-analysis values.

(8) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(9) Measure HC (except diesels), CO, CO_2 and NO_x concentrations in the sample bag(s) with approximately the same flow rates and pressures used in paragraph (d)(5) of this section. Constituents measured continuously do not require bag analysis.

(10) Rechecking of the zero and span point after the analysis of the bag is permitted. The number of bags that may be analyzed after pre-analysis values for zero and span have been determined is not specified. The limiting criteria on the time span or the number of events that may occur between the pre-analysis and post-analysis zero span checks are the following:

(i) A pre-analysis zero and span value for each range of each constituent to be analyzed must be determined and identified or recorded prior to analyzing the bag. The bag may be sampled in order to identify the specific range required prior to the determination of the pre-analysis values.

(ii) A post-analysis zero and span check for each range used must be performed and the values recorded. The time interval or the number of events that may occur between the pre and post checks is not specified. However, the difference between pre-analysis zero and span values (recorded in paragraph

(d) (7) and (8) of this section) versus those recorded for the post-analysis check may not exceed the zero drift limit or the span drift limit of 2 percent of full scale chart deflection for any range used.

(iii) The time span between the pre and post checks may be no longer than the time period that was used to evaluate the analyzer drift performance.

(11) Analyze the remaining sample and background bags as outlined in paragraph (d) (4) through (10) of this section.

(e) For continuous sample analysis perform the following sequences:

(1) Warm-up and stabilize the analyzers.

(2) Clean and/or replace filters elements, conditioning columns (if used) etc., as necessary.

(3) The order of paragraphs (d) (1) and (2) of this section may be interchanged.

(4) Leak check portions of the sampling system that operate under a vacuum when sampling.

(5) Allow heated sample lines, filters, pumps, etc., to stabilize at operating temperature.

(6) The order of paragraphs (d) (4) and (5) may be interchanged.

(7) Obtain a stable zero reading.

(8) Zero and span each range to be used on each analyzer used prior to the beginning of the cold cycle. The span gases shall have a concentration between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures shall be approximately the same as those encountered during sampling.

(9) Re-check zero response, repeat paragraphs (d) (7) and (8) of this section or use software zero and span if necessary.

(10) If a chart recorder is used, identify the most recent zero and span response as the pre-analysis values.

(11) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(12) Measure the emissions (HC required for diesels, NO_x, CO, CO_2 optional) continuously during the cold start cycle. Indicate the start of the test, the range(s) used, and the end of the test on the recording medium (chart paper or ADC equipment). Use approximately the same flow rates and system pressures used in paragraph (d)(8) of this section.

(13) Collect background HC, CO, CO_2, and NO_x in a sample bag.

(14) Perform a post-analysis zero and span check for each range used at the conditions specified in paragraph (d)(8) of this section.

(15) Neither the zero drift nor the span drift between the pre-analysis and post-analysis checks on any range used may exceed 3 percent for HC or 2 percent for NO_x, CO, and CO_2 of full scale chart deflection, or the test is void.

(16) Determine HC background levels for the cold start cycle by introducing a sample from the background bag into the overflow HC span system.

(17) Determine background levels of NO_x, CO, or CO_2 (if necessary) by the technique outlined in paragraph (e) of this section. the continuous analyzers may be used for analysis under paragraph (e).

Note.—For a quality control check on diesel HC, compare an analysis of a background bag to a continuous analysis of background air sampled through the total hydrocarbon probe. For best results, the difference should be less than 1 percent of the average (time integrated) dilute hydrocarbon emission level during the test.

(18) Repeat paragraphs (d) (7) through (17) of this section for the hot cycle. The post-analysis zero and span check for the cold start (or previous hot start) cycle may be used for the pre-analysis zero and span for the following hot start cycle.

(19) If the HC drift is greater than 3 percent of full-scale chart deflection, hydrocarbon hang-up is suspected.

(f) HC hang-up. If HC hang-up is suspected, the following sequence may be performed.

(1) Fill a clean sample bag with zero gas.

(2) Zero and span the HFID with the overflow system.

(3) Analyze the sample bag through the overflow sample system.

(4) Analyze the sample bag on another FID or HFID meeting the specification of this Subpart or 40 CFR, Subpart D that does not have a hang-up problem.

(5) If the difference between the readings obtained in (3) percent of the HFID full scale disconnect probe and clean same. (Soaking with sulfuric acid has proven effective.) Clean sample line also. (Heating to 450° F and flow nitrogen gas continuously for 12 hours has proven useful.)

(6) Reassemble the sample system, heat to specified temperature, and repeat the procedure in paragraph (f) (1) through (6) of this section.

§ 86.1341-84 Test cycle validation criteria.

(a) To reduce errors between the feedback and reference (cycle trace) values the engine speed and torque feedback signals may be shifted a maximum of ±5 seconds with respect to the reference speed and torque traces. If the feedback signals are shifted, both speed and torque must be shifted the same amount in the same direction.

(b) Calculate the brake horsepower for each pair of engine speed and torque values recorded. Also calculate the reference brake horsepower for each pair of engine speed and torque reference values. Calculations shall be to five significant digits.

(c) Linear regressions of feedback value on reference value shall be performed for speed, torque and brake horsepower. The method of least-square shall be used. The equation shall have the form:

$y = mx + b$

Where:

y = The feedback (actual) value of speed (in RPM), torque (in ft-lbs.), or brake horsepower.
m = Slope of the regression line.
x = The reference value (speed, torque, or brake horsepower).
b = The y intercept of the regression line.

(d) The standard error of estimate (SE) of y on x and the coefficient of determination (r^2) shall be calculated for each regression line.

(e) For a valid test the criteria in Figure N84–12 must be met for both cycles (cold start and hot start) individually. Deletions from the regression analysis are permitted where allowed in Figure N84–12.

(f) The integrated brake horsepower-hour for each cycle (cold and hot start) shall be between −15 percent and +5 percent of the integrated brake horsepower-hour for the reference cycle or the test is void. All torque and speed data points must be used to calculate the integrated brake horsepower-hour. For the purposes of this calculation, negative torque values (i.e., motoring horsepower) shall be set equal to zero and included.

(g) If a dynamometer test run is determined to be statistically or experimentally void, corrective action shall be taken. The engine shall then be allowed to cool (naturally or forced) and the dynamometer test rerun per § 86.1337–84.

BILLING CODE 6560-01-M

REGRESSION LINE TOLERANCES

	SPEED	TORQUE	BRAKE HORSEPOWER
STANDARD ERROR OF ESTIMATE (SE) OF Y ON X	100 RPM	13% OF MAXIMUM ENGINE TORQUE	8% OF MAXIMUM BRAKE HORSEPOWER
SLOPE OF THE REGRESSION LINE, M	0.970-1.030	0.83-1.03 HOT 0.77-1.03 COLD	0.89-1.03 (HOT) 0.87-1.03 (COLD)
COEFFICIENT OF DETERMINATION, R^2	0.9700 1/	0.8800 (HOT) 1/ 0.8500 (COLD) 1/	0.9100 1/
Y INTERCEPT OF THE REGRESSION LINE, B	± 50 RPM	± 15 FT. LBS.	± 5.0 OF BRAKE HORSEPOWER

1/ MINIMUM

PERMITTED POINT DELETIONS FROM REGRESSION ANALYSIS

CONDITION	POINTS TO BE DELETED
FIRST 24 SECONDS (± 1) OF FREE IDLE OF HOT AND COLD CYCLES	SPEED, TORQUE, BRAKE HORSEPOWER
WIDE OPEN THROTTLE { SPEED CONTROL: TORQUE FEEDBACK < TORQUE REFERENCE }	TORQUE, BRAKE HORSEPOWER
WIDE OPEN THROTTLE { TORQUE CONTROL: SPEED FEEDBACK < SPEED REFERENCE }	SPEED, BRAKE HORSEPOWER
SPEED CONTROL, CLOSED THROTTLE, TORQUE REFERENCE < ZERO	TORQUE, BRAKE HORSEPOWER
GASOLINE FUELED ENGINES EQUIPPED WITH AUTOMATIC CHOKES; FIRST 150 SECONDS OF COLD CYCLE OR FIRST 30 SECONDS OF HOT CYCLE, CLOSED THROTTLE AND: MANUAL TRANSMISSION, IF TORQUE FEEDBACK	
A. IS EQUAL TO ZERO (± 10 FT. LBS.) OR;	SPEED BRAKE HORSEPOWER
B. AUTOMATIC TRANSMISSION, IF TORQUE FEEDBACK IS EQUAL TO CURB IDLE TRANSMISSION TORQUE (± 10 FT. LBS.)	SPEED BRAKE HORSEPOWER

BILLING CODE 6560-01-C

§ 86.1342-84 Calculations; exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$A_{wm} = \frac{1/7(g_C) + 6/7(g_H)}{1/7(BHP\text{-}Hr_C) + 6/7(BHP\text{-}Hr_H)}$$

Where:

A_{wm} = Weighted mass emission level (HC, CO, CO_2 or NO_x) in grams per brake horsepower hour.

g_C = Mass emission level in grams, measured during the cold start test.

g_H = Mass emissions level in grams, measured during the hot start test.

$BHP\text{-}HR_C$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the cold start test.

$BHP\text{-}HR_H$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the hot start test.

(b) The mass of each pollutant for the cold start test and the hot start test for bag measurements and diesel heat exchanger sample system measurements is determined from the following equations:

(1) Hydrocarbon mass: $HC_{mass} = V_{mix} \times Density_{HC} \times (HC_{conc}/1{,}000{,}000)$.

(2) Oxides of nitrogen mass: $NO_{x\ mass} = V_{mix} \times Density_{NO_2} \times K_H \times (NO_{x\ conc}/1{,}000{,}000)$.

(3) Carbon monoxide mass: $CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/1{,}000{,}000)$.

(4) Carbon dioxide mass: $CO_{2\ mass} = V_{mix} \times Density_{CO_2} \times (CO_{2\ conc}/100)$.

(c) The mass of each pollutant for the cold start test and the hot start test for flow compensated sample systems is determined from the following equations:

$$(1)\ HC_{mass} = \sum_{i=1}^{n}\left[\frac{(HC_e)_i}{10^6} \times (Vmix)_i \times (Density_{HC}) \times \Delta T\right] - \frac{HC_d}{10^6}\left(1 - \frac{1}{DF}\right) \times Vmix \times Density_{HC}$$

$$(2)\ NOx_{mass} = \sum_{i=1}^{n}\left[\frac{(NOx_e)_i}{10^6} \times (Vmix)_i \times (Density_{NO_2}) \times \Delta T\right] - \frac{NOx_d}{10^6}\left(1 - \frac{1}{DF}\right) \times Vmix \times Density\ NO_2$$

$$(3)\ CO_{mass} = \sum_{i=1}^{n}\left[\frac{(CO_e)_i}{10^6} \times (Vmix)_i \times (Density_{CO}) \times \Delta T\right] - \frac{CO_d}{10^6}\left(1 - \frac{1}{DF}\right) \times Vmix \times Density_{CO}$$

$$(4)\ CO_{2mass} = \sum_{i=1}^{n}\left[\frac{(CO_{2_e})_i}{10^6} \times (Vmix)_i\right] \times (Density_{CO_2}) \times \Delta T - \frac{CO_{2_d}}{10^6}\left(1 - \frac{1}{DF}\right) \times Vmix \times Density_{CO_2}$$

(d) Meaning of symbols:

(1) HC_{mass} = Hydrocarbon emissions, in grams per test phase.

Density = Density of hydrocarbons is 16.33 g/ft³ (.5768 kg/m³), assuming an average carbon to hydrogen ratio of 1:1.85, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane X3.

$HC_{conc} = HC_e - HC_d[1-(1/DF)]$

Where:

HC_e = Hydrocarbon concentration of the dilute exhaust bag sample or, for diesel heat exchanger systems, average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent. For flow compensated sample systems HC_e is the instantaneous concentration.

HC_d = Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(2) $NO_{x\ mass}$ = Oxides of nitrogen emissions, in grams per test phase.

$Density_{NO_2}$ = Density of oxides of nitrogen is 54.16 g/ft³ (1.913 kg/m³), assuming they are in the form of nitrogen dioxide, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

$NO_{x\ conc}$ = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

$NO_{x\ conc} = NO_{x\ e} - NO_{x\ d}[1-(1/DF)]$.

Where:

$NO_{x\ e}$ = Oxides of nitrogen concentration of the dilute exhaust bag sample as measured, in ppm. For flow compensated sample systems $NO_{x\ e}$ is the instantaneous concentration.

$NO_{x\ d}$ = Oxides of nitrogen concentration of the dilute air as measured, in ppm.

(3) CO_{mass} = Carbon monoxide emissions, in grams per test phase.

$Density_{CO}$ = Density of carbon monoxide is 32.97 g/ft³ (1.164 kg/m³), at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm.

$CO_{conc} = CO_e - CO_d\,[1-(1/DF)]$.

Where:

CO_e = Carbon monoxide concentration of the dilute exhaust bag sample volume corrected for water vapor and carbon dioxide extraction, in ppm. For flow compensated sample systems CO_e is the instantaneous concentration. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$CO_e = [1 - 0.01925CO_{2e} - 0.000323R]CO_{em}$.

Where:

CO_{em} = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

CO_{2e} = Carbon dioxide concentration of the dilute exhaust bag sample, in percent. For flow compensated sample systems CO_{2e} is the instantaneous concentration.

R = Relative humidity of the dilution air, in percent (see § 86.1342-84(a)(5)).

CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

$CO_d = (1 - 0.000323R)CO_{dm}$.

Where:

CO_{dm} = Carbon monoxide concentration of the dilution air sample as measured, in ppm.

Δt = Time interval (in seconds) between samples in flow compensated systems (0.2 seconds maximum).

Note.—If a CO instrument which meets the criteria specified in § 86.1311-84 is used and the conditioning column has been deleted, CO_{em} can be substituted directly for CO_e and CO_{dm} can be substituted directly for CO_d.

(4) $CO_{2\ mass}$ = Carbon dioxide emissions, in grams per test phase.

$Density_{CO_2}$ = Density of carbon dioxide is 51.85 g/ft³ (1.843 kg/m³), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

$CO_{2\ conc}$ = Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

$CO_{2\ conc} = CO_{2e} - CO_{2d}[1-(1/DF)]$.

Where:

CO_{2d} = Carbon dioxide concentration of the dilution air as measured, in percent.

(5) $DF = 13.4/[CO_{2e} + (HC_e + CO_e \times 10^{-4}]$.

K_H = Humidity correction factor.

For gasoline engines:

$K_H = 1/[1 - 0.0047\,(H-75)]$.

(or for SI units $= 1/[1 - 0.0329(H - 10.71)]$).

For diesel engines:

$K_H = 1$.

Where:

H = Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.

$H = [(43.478)R_a \times P_d]/[P_B - (P_d \times R_a/100)]$ for SI units, $H = [(6.211)R_a \times P_d]/[P_B - (P_d \times R_a/100)]$.

R_a = Relative humidity of the ambient air, in percent.

P_d = Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature.
P_B = Barometric pressure, in mm Hg (kPa).
V_{mix} = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528° R (293° K) and 760 mm Hg (101.3 kPa).
V_{mix} = Instantaneous dilute exhaust volumetric flow rate (for compensated flow systems), in cubic feet per second.

For PDP–CVS, V_{mix} is:

$$V_{mix} = V_o \times \frac{N(P_B - P_A)\,(528°R)}{(760\text{ mm Hg})\,(T_p)}$$

for SI units,

$$V_{mix} = V_o \times \frac{N(P_B - P_A)\,(293.15°K)}{(101.3\text{ kPa})\,(T_p)}$$

Where:

V_o = Volume of gas pumped by the positive displacement pump, in cubic feet (cubic metres) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.
P_B = Barometric pressure, in mm Hg (kPa).

P_A = Pressure depressions below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

T_p = Average temperature of dilute exhaust entering positive displacement pump during test, °R (°K).

(d) Sample calculation of mass values of exhaust emissions:

(1) Assume the following test results for gasoline engine:

	Cold start cycle test results	Hot start cycle test results
V_{mix}	6924 ft³	6873 ft³.
R	30.2 pct	30.2 pct.
R_a	30.2 pct	30.2 pct.
P_B	735 mm Hg	735 mm Hg.
P_d	22.676 mm Hg	22.676 mm Hg.
HC_e	132.07 ppm C equivalent.	86.13 ppm C equivalent.
NO_{x_e}	7.86 ppm	10.98 ppm.
CO_{em}	171.22 ppm	114.28 ppm.
CO_{2e}	.178 pct	.381 pct.
HC_d	3.60 ppm C equivalent.	8.70 ppm C equivalent.

	Cold start cycle test results	Hot start cycle test results
NO_{x_d}	0.0 ppm	010 ppm.
CO_{dm}	0.89 ppm	0.89 ppm.
CO_{2d}	0.0 pct	0.038 pct.
BHP–HR	0.259	0.347.

Then:

Cold Start Test

$H = [(43.478)(30.2)(22.676)]/[735 - (22.676)(30.2)/100] = 41$ grains of water per pound of dry air.
$K_H = 1/[1 - 0.0047(41-75)] = 0.862$
$CO_e = [1 - 0.01925(.178) - 0.000323(30.2)]171.22 = 169.0$ ppm
$CO_d = [1 - 0.000323(30.2)]0.89 = .881$ ppm
$DF = 13.4/[.178 + (132.1 + 168.9)(10^{-4})] = 64.392$
$HC_{conc} = 132.1 - 3.6[1 - (1/64.265)] = 128.6$ ppm
$HC_{mass} = 6924(16.33)(128.6/1{,}000{,}000) = 14.53$ grams
$NO_{x\ conc} = 7.86 - 0.0[1 - (1/64.265)] = 7.86$ ppm
$NO_{x\ mass} = 6924(54.16)(.862)(7.86/1{,}000{,}000) = 2.54$ grams
$CO_{conc} = 169.0 - .881[1 - (1/64.265)] = 168.0$ ppm
$CO_{mass} = 6924(32.97)(168.0/1{,}000{,}000) = 38.35$ grams
$CO_{2\ conc} = .178 - 0[1 - 1/64.265)] = .178\%$
$CO_{2\ mass} = 6924(51.85)(.178/100) = 639$ grams

Hot Start Test

Assume similar calculations result in the following:
$HC_{mass} = 8.72$ grams
$NO_{x\ mass} = 3.49$ grams
$CO_{mass} = 25.70$ grams
$CO_{2\ mass} = 1226$ grams

(2) Weighted mass emission results:

$$NOx_{mass} = 3.49 \text{ grams}$$

$$HC_{wm} = \frac{1/7(14.53) + 6/7(8.72)}{1/7(0.259) + 6/7(0.347)}$$

$$= 28.6 \text{ grams/BHP–HR}$$

$$NOx_{wm} = \frac{1/7(2.54) + 6/7(3.49)}{1/7(0.259) + 6/7(0.347)}$$

$$= 10.0 \text{ grams/BHP–HR}$$

$$CO_{wm} = \frac{1/7(38.35) + 6/7(25.70)}{1/7(0.259) + 6/7(0.347)}$$

$$= 82.2 \text{ grams/BHP–HR}$$

$$CO_{2wm} = \frac{1/7(639) + 6/7(1226)}{1/7(0.259) + 6/7(0.347)}$$

$$= 3415 \text{ grams/BHP–HR}$$

(e) The final reported brake-specific fuel consumption (BSFC) shall be computed by use of the following formula:

$$BSFC = \frac{1/7(M_C) + 6/7(M_H)}{1/7(BHP\text{–}HR_C) + 6/7(BHP\text{–}HR_H)}$$

Where:
BSFC = brake-specific fuel consumption in pounds of fuel per brake horsepower-hour (lbs/BHP–HR).
M_C = mass of fuel, in pounds, used by the engine during the cold start test.
M_H = mass of fuel, in pounds, used by the engine during the hot start test.
$BHP\text{–}HR_C$ = total brake horsepower-hours (brake horsepower integrated with respect to time) for the cold start test.
$BHP\text{–}HR_H$ = total brake horsepower-hours (brake horsepower integrated with respect to time) for the hot start test.

(f) The mass of fuel for the cold start and hot start test is determined from the following equation:

$M = (G_s/R_2)\,(1/453.6)$

(g) Meaning of symbols:

M = Mass of fuel, in pounds, used by the engine during the cold or hot start test.
G_s = Grams of carbon measured during the cold or hot start test.
$G_s = [12.011/(12.011 + \alpha(1.008))]HC_{mass} + 0.429CO_{mass} + 0.273\ CO_{2\ mass}$

Where:
HC_{mass} = Hydrocarbon emissions, in grams for cold or hot start test.
CO_{mass} = Carbon monoxide emissions, in grams for cold or hot start test.
$CO_{2\ mass}$ = Carbon dioxide emissions, in grams for cold or hot start test.
α = The measured hydrogen to carbon ratio of the fuel.
R_2 = The grams of carbon in the fuel per gram of fuel
$R_2 = 12.011/[12.011 + \alpha(1.008)]$

(h) Sample calculation of brake-specific fuel consumption:

(1) Assume the following test results:

	Cold start cycle test results	Hot start cycle test results
BHP–HR	6.945	7.078.
α	1.85	1.85.
HC_{mass}	37.08 grams	28.82 grams.
CO_{mass}	357.69 grams	350.33 grams.
$CO_{2\ mass}$	5419.62 grams	5361.32 grams.

Then:

G_s for cold start test = $[12.011/(12.011 + (1.85)(1.008))](37.08) + 0.429(357.69) + 0.273(5419.62) = 1665.10$ grams

G_s for hot start test=[12.011/(12.011+(1.85)(1.008))](28.82)+0.429(350.33)+0.273(5361.32)=1638.88 grams
R_s=12.011/[12.011+1.85(1.008)]=.866
M_c=(1665.10/.866)(1/453.6)=4.24 lbs.
M_H=(1638.88/.866)(1/453.6)=4.17 lbs.

(2) Brake-specific fuel consumption results:

$$BSFC = \frac{1/7(4.24) + 6/7(4.17)}{1/7(6.945) + 6/7(7.078)}$$

$$= .592 \text{ lbs. of fuel/BHP-HR}$$

§ 86.1343-84 [Reserved]

§ 86.1344-84 Required information.

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set-up and descriptive data.* This data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. This data is necessary to insure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. This data is not required for tests performed by the manufacturers.

(2) *Pre-test data.* This data is general test data that must be recorded for each test. The data is of a more descriptive nature such as identification of the test engine, test site number, etc. As such, this data can be recorded at any time within 24 hours of the test.

(3) *Test-data.* This data is physical test data that must be recorded at the time of testing.

(b) All data may be supplied to the Administrator by punch cards, magnetic tape, or other electronic data processing means. Acceptable data formats and transmission techniques will be provided in the Application Format for Certification of the applicable Model Year.

(c) *Engine set-up data.* Because the specific test facilities may change somewhat with time, the specific data parameters and number of items may vary slightly. The Application Format for Certification for the applicable Model Year will specify the exact requirements. In general, the following type of data will be required:

(1) Engine manufacturer.
(2) Engine system combination.
(3) Engine code and CID.
(4) Engine identification number.
(5) Applicable engine model year.
(6) Engine fuel type.
(7) Recommended oil type.
(8) Exhaust pipe configuration pipe sizes, etc.
(9) Curb idle speed.
(10) Dynamometer idle speed. (Automatic transmission engines only.)
(11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.
(12) Engine performance data such as, maximum BHP, rated speed, fuel flow, governed speed, etc.
(13) Recommended start-up procedure.
(14) Maximum safe engine operating speed.
(15) Number of hours of operation accumulated on engine.

(b) *Pre-test data.* The following data shall be recorded, and reported to the Administrator for each test conducted for Compliance with the provisions of 40 CFR Part 86, Subpart A:

(1) Engine-system combination.
(2) Engine identification.
(3) Instrument operator(s).
(4) Engine operator(s).
(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N84-10).
(6) Fuel identification with average of test fuel used.
(7) Date of most recent analytical assembly calibration.
(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(c) *Test data.* The physical parameters necessary to compute the test results and insure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following type of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable Model Year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.
(2) Test number.
(3) Engine intake air or test cell temperature.
(4) Barometric pressure.

Note.—A central laboratory barometer may be used: *Provided,* That individual test cell barometric pressure are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(5) Engine intake air or test cell and CVS dilution air humidity.
(6) Maximum torque versus speed curve as determined in § 86.1332, with minimum and maximum engine speeds.
(7) Measured maximum horsepower, maximum torque, and rated speeds.
(8) Measured maximum horsepower and torque.
(9) High idle engine speed (diesel engines only).
(10) Fuel consumption at maximum power and torque (diesel engines only).
(11) Curb-idle fuel flow rate.
(12) Cold soak time interval and cool down procedures.
(13) Temperature set point of the heated continuous analysis system components (if applicable).
(14) Test cycle validation criteria as specified in § 86.1341-84 for each test phase (cold-hot).
(15) Total CVS flow rate with dilution factor for each test phase (cold-hot).
(16) Sample concentrations (background corrected) for HC, CO, CO_2, and NO_x for each test phase (cold-hot).
(17) Brake specific emissions (g/BHP-hr) for HC, CO and NO_x for each test phase (cold-hot).
(18) The weighted (cold-hot) brake specific emissions (g/BHP-hr) for the total test.
(19) The weighted (cold-hot) carbon balance brake specific fuel consumption for the total test.
(20) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

25. Appendix I of Part 86 is amended to read as follows:

Appendix I-Urban Dynamometer Schedules

(a) * * *
(b) * * *
(c) * * *
(d) * * *
(e) * * *

(f) EPA Engine Dynamometer Schedule for Heavy-Duty Gasoline Engines.

Percent Revolutions per Minute and Torque Versus Time Sequence

Record (sec)	Revolutions per minute	Torque
0	0.0	0.0
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	0.0	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
11	0.0	0.0
12	0.0	0.0
13	0.0	0.0
14	0.0	0.0
15	0.0	0.0
16	0.0	0.0
17	0.0	0.0
18	0.0	0.0
19	0.0	0.0
20	0.0	0.0
21	0.0	0.0
22	0.0	0.0
23	0.0	0.0
24	0.0	0.0
25	−1.78	44.40
26	0.0	85.35
27	4.25	100.00
28	27.47	100.00
29	42.96	100.00
30	45.79	100.00
31	48.11	99.46
32	50.42	90.00
33	52.74	75.23
34	54.00	50.00
35	44.42	8.96
36	45.05	−10.00
37	46.00	9.99
38	37.69	−10.00
39	31.61	5.68
40	22.94	35.29
41	24.00	4.87
42	20.86	−10.00
43	12.45	−10.00
44	6.00	−10.00
45	6.52	−10.00
46	7.17	−10.00
47	2.56	−10.00
48	0.0	0.0
49	0.0	0.0
50	0.0	0.0
51	0.0	10.11
52	4.32	46.40
53	8.90	45.17
54	1.95	50.00
55	3.33	41.68
56	4.00	89.46
57	13.76	55.60
58	26.43	26.96
59	33.85	−6.16
60	36.00	−10.00
61	34.45	−10.00
62	34.00	−10.00
63	35.64	−10.00
64	32.99	27.39
65	36.00	80.00
66	41.63	74.37
67	60.41	26.76
68	48.44	−10.00
69	43.86	−10.00
70	40.39	−10.00
71	38.50	4.01
72	35.05	30.00
73	40.66	16.70
74	43.64	26.45
75	45.96	−10.00
76	47.10	−10.00
77	49.29	−10.00
78	37.10	−10.00
79	36.00	−10.00
80	34.47	−10.00
81	32.15	−10.00
82	31.67	−10.00
83	28.48	13.89
84	32.38	90.00
85	36.00	90.00
86	41.69	90.00
87	45.74	90.00
88	49.95	80.00
89	49.10	80.00
90	50.59	62.97
91	45.99	34.98
92	42.76	7.23
93	35.12	−10.00
94	32.06	67.92
95	35.53	62.55
96	46.57	68.60
97	49.77	48.85
98	52.00	60.00
99	58.06	60.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
100	63.66	23.42
101	64.14	17.84
102	59.58	3.76
103	38.00	42.26
104	39.09	30.00
105	40.00	30.00
106	34.85	47.18
107	32.03	10.33
108	34.00	33.48
109	34.00	50.00
110	33.02	20.69
111	25.54	−10.00
112	15.57	−10.00
113	14.00	−10.00
114	14.47	27.64
115	18.00	4.49
116	17.13	−10.00
117	16.00	−10.00
118	10.02	−10.00
119	9.81	−10.00
120	5.88	−10.00
121	4.00	−10.00
122	4.00	−10.00
123	2.93	−10.00
124	0.62	−10.00
125	0.0	0.0
126	0.0	0.0
127	0.0	0.0
128	0.0	0.0
129	0.0	0.0
130	0.0	10.00
131	0.0	10.00
132	0.0	29.02
133	0.0	27.83
134	0.0	7.34
135	0.0	0.0
136	0.0	0.0
137	0.0	0.0
138	0.0	0.0
139	0.0	0.0
140	0.0	0.0
141	0.0	0.0
142	0.0	0.0
143	0.0	0.0
144	0.0	0.0
145	0.0	0.0
146	2.00	0.0
147	1.38	0.0
148	0.0	0.0
149	0.0	6.27
150	0.0	2.16
151	0.0	0.0
152	0.0	0.0
153	0.0	0.0
154	0.83	−10.00
155	2.00	−10.00
156	0.54	−10.00
157	0.0	0.0
158	0.0	0.0
159	0.0	0.0
160	0.0	0.0
161	0.0	0.0
162	0.0	0.0
163	0.0	0.0
164	0.0	0.0
165	0.0	0.0
166	0.0	0.0
167	0.0	22.01
168	1.23	72.29
169	6.63	80.00
170	17.29	89.29
171	22.17	90.00
172	24.00	82.70
173	24.00	31.96
174	24.00	−10.00
175	22.57	−10.00
176	22.00	−10.00
177	13.88	−10.00
178	10.00	−10.00
179	9.31	−10.00
180	3.99	−10.00
181	0.0	0.0
182	0.0	0.0
183	0.0	0.0
184	0.0	0.0
185	0.0	0.0
186	0.0	0.0
187	0.0	0.0
188	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
189	0.0	0.0
190	0.0	0.0
191	0.0	0.0
192	0.0	0.0
193	0.0	0.0
194	0.0	0.0
195	0.0	0.0
196	0.0	0.0
197	0.0	0.0
198	0.0	0.0
199	0.0	0.0
200	0.0	0.0
201	0.0	0.0
202	0.0	0.0
203	0.0	0.0
204	−2.52	6.30
205	−4.22	15.28
206	0.0	10.00
207	0.0	10.00
208	0.0	10.00
209	0.0	75.93
210	0.0	32.22
211	1.67	35.00
212	15.48	29.82
213	25.46	−10.00
214	24.22	−10.00
215	23.44	−10.00
216	12.41	80.00
217	8.94	83.61
218	7.26	84.82
219	16.70	80.00
220	24.67	63.33
221	0.24	79.81
222	0.0	8.52
223	0.0	0.0
224	0.0	0.0
225	0.0	0.0
226	0.0	0.0
227	0.0	0.0
228	0.0	0.0
229	0.0	0.0
230	0.0	0.0
231	0.0	0.0
232	0.0	0.0
233	0.0	17.59
234	0.0	19.63
235	0.0	10.00
236	0.0	10.00
237	0.0	10.00
238	0.0	3.34
239	0.0	0.0
240	0.0	0.0
241	0.0	0.0
242	0.0	0.0
243	0.0	0.0
244	0.0	0.0
245	0.0	0.0
246	0.0	0.0
247	0.0	0.0
248	0.0	0.0
249	0.0	0.0
250	0.0	0.0
251	0.0	0.0
252	0.0	0.0
253	0.0	0.0
254	0.0	0.0
255	0.0	0.0
256	0.0	0.0
257	0.0	0.0
258	0.0	0.0
259	0.0	0.0
260	0.0	0.0
261	0.0	0.0
262	0.0	0.0
263	0.0	0.0
264	0.0	0.0
265	0.0	0.0
266	0.0	0.0
267	0.0	0.0
268	0.0	0.0
269	0.0	0.0
270	0.0	0.0
271	0.0	0.0
272	0.0	0.0
273	0.0	0.0
274	0.0	0.0
275	0.0	0.0
276	0.0	0.0
277	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
278	0.0	0.0
279	0.0	0.0
280	0.0	0.0
281	0.0	4.17
282	1.15	10.00
283	2.00	10.00
284	0.22	10.00
285	0.0	0.0
286	0.0	0.0
287	0.0	0.0
288	0.0	0.0
289	0.0	0.0
290	0.0	0.0
291	0.0	0.0
292	0.0	0.0
293	0.0	0.0
294	0.0	0.0
295	0.0	0.0
296	0.0	0.0
297	0.0	0.0
298	0.0	0.0
299	0.0	0.0
300	0.0	4.07
301	0.0	10.00
302	0.0	17.22
303	0.0	20.00
304	0.0	20.37
305	2.33	31.94
306	16.22	36.48
307	24.00	24.91
308	24.00	13.34
309	19.06	10.00
310	18.00	−10.00
311	17.17	−10.00
312	9.04	−10.00
313	1.09	−10.00
314	0.0	0.0
315	0.0	0.0
316	0.0	0.0
317	0.0	0.0
318	0.0	0.0
319	0.0	0.0
320	0.0	0.0
321	0.0	0.0
322	0.0	0.0
323	0.0	0.82
324	0.37	41.08
325	2.68	90.00
326	6.00	94.99
327	11.94	100.00
328	15.63	100.00
329	41.26	90.28
330	46.26	90.00
331	44.56	67.08
332	36.00	1.12
333	27.58	50.12
334	23.52	90.00
335	24.00	90.00
336	26.29	70.00
337	30.00	65.38
338	30.00	34.47
339	30.00	10.00
340	30.00	10.00
341	30.00	10.00
342	30.18	60.00
343	40.00	58.25
344	40.67	50.00
345	41.02	50.00
346	40.00	50.00
347	41.61	50.00
348	42.00	50.00
349	46.00	50.00
350	48.22	50.00
351	59.21	58.69
352	67.18	70.00
353	71.00	70.00
354	72.00	70.00
355	72.13	68.08
356	74.89	28.94
357	68.91	−10.00
358	49.71	−10.00
359	41.84	−10.00
360	38.30	−10.00
361	35.93	−10.00
362	28.00	−10.00
363	23.48	−10.00
364	10.16	−10.00
365	4.72	−10.00
366	0.82	5.90

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
367	−9.53	19.53
368	2.20	45.60
369	20.53	7.33
370	21.15	0.0
371	17.67	−10.00
372	13.04	−10.00
373	8.41	79.70
374	10.33	100.00
375	17.27	100.00
376	22.00	100.00
377	25.16	100.00
378	29.37	100.00
379	36.73	66.35
380	40.00	−10.00
381	23.50	−10.00
382	9.37	−10.00
383	8.00	−10.00
384	6.74	−10.00
385	2.86	−10.00
386	0.11	−10.00
387	0.0	0.0
388	0.0	0.0
389	0.0	0.0
390	0.0	0.0
391	0.0	0.0
392	0.0	0.0
393	0.0	0.0
394	0.0	0.0
395	0.0	0.0
396	0.0	0.0
397	0.0	0.0
398	0.0	0.0
399	0.0	0.0
400	0.0	0.0
401	0.0	0.0
402	0.0	0.0
403	0.0	0.0
404	0.0	0.0
405	0.0	0.0
406	0.0	0.0
407	0.0	0.0
408	0.0	0.0
409	0.0	0.0
410	0.0	0.0
411	0.0	0.0
412	0.0	0.0
413	0.0	0.0
414	0.0	0.0
415	0.0	0.0
416	0.0	0.0
417	0.0	0.0
418	0.0	0.0
419	2.27	20.00
420	2.82	14.11
421	0.0	0.0
422	0.0	0.0
423	0.0	0.0
424	0.0	0.0
425	0.0	0.0
426	0.0	0.0
427	0.0	0.0
428	0.0	0.0
429	0.0	0.0
430	0.0	0.0
431	0.26	0.78
432	16.60	31.63
433	45.32	29.78
434	43.00	10.00
435	40.69	10.00
436	35.12	10.00
437	28.18	19.70
438	28.26	47.45
439	30.00	30.00
440	30.00	30.00
441	30.00	30.00
442	34.54	30.00
443	36.00	30.00
444	36.43	30.00
445	43.84	30.00
446	50.00	30.00
447	50.00	−24.56
448	50.00	20.00
449	50.00	−10.00
450	37.97	−10.00
451	35.30	−10.00
452	30.68	−10.00
453	27.02	−10.00
454	26.00	−10.00
455	26.00	−10.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
456	20.24	−10.00
457	14.00	−10.00
458	13.45	18.27
459	9.40	52.99
460	10.72	81.81
461	15.50	97.48
462	19.62	100.00
463	20.25	100.00
464	25.76	100.00
465	35.02	100.00
466	42.14	94.65
467	44.00	90.00
468	45.70	90.00
469	51.99	60.00
470	50.00	60.00
471	51.29	63.22
472	54.96	70.00
473	56.00	70.00
474	62.35	38.25
475	71.61	30.00
476	76.22	50.00
477	78.00	50.00
478	78.00	41.53
479	55.93	12.58
480	38.52	0.0
481	34.42	71.65
482	36.11	79.47
483	38.84	67.90
484	42.74	60.00
485	44.00	54.75
486	49.46	36.35
487	52.00	30.00
488	32.05	−10.00
489	25.69	0.0
490	24.00	0.0
491	24.00	−10.00
492	20.24	−10.00
493	10.16	68.43
494	8.00	80.58
495	10.20	80.99
496	13.54	90.00
497	18.00	94.13
498	20.28	100.00
499	22.00	100.00
500	23.77	91.15
501	28.08	90.00
502	30.00	86.01
503	32.85	80.70
504	32.86	100.00
505	33.37	100.00
506	36.00	100.00
507	51.77	100.00
508	60.57	95.72
509	64.00	70.00
510	64.91	70.00
511	75.83	70.00
512	82.00	70.00
513	85.72	51.42
514	86.17	49.14
515	88.49	35.13
516	90.00	15.99
517	91.12	26.74
518	92.00	32.85
519	93.74	30.00
520	89.29	−10.00
521	66.00	41.87
522	67.38	56.88
523	80.02	54.96
524	93.95	66.34
525	97.63	63.69
526	94.11	60.00
527	85.66	−10.00
528	70.00	−10.00
529	69.11	−10.00
530	66.80	−10.00
531	64.48	−10.00
532	53.00	44.98
533	52.73	49.27
534	62.00	40.00
535	62.00	43.88
536	64.18	44.55
537	53.36	4.88
538	46.28	15.79
539	46.00	19.83
540	45.65	10.00
541	45.99	10.00
542	48.05	10.00
543	44.71	3.54
544	48.82	−10.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
545	51.92	66.82
546	47.53	−10.00
547	36.31	9.23
548	17.73	55.68
549	29.43	38.22
550	36.00	37.46
551	36.00	40.00
552	34.00	40.00
553	34.00	40.00
554	34.00	36.25
555	38.26	24.68
556	43.38	61.38
557	50.78	46.12
558	52.00	19.92
559	52.32	0.0
560	52.09	3.19
561	48.00	10.00
562	48.00	10.00
563	48.00	10.00
564	30.94	19.48
565	28.00	20.00
566	28.00	20.00
567	28.00	15.81
568	28.00	10.00
569	26.53	10.00
570	26.00	10.00
571	23.71	−10.00
572	17.59	−10.00
573	11.65	−10.00
574	1.92	−10.00
575	0.0	0.0
576	0.0	0.0
577	0.0	0.0
578	0.0	0.0
579	0.0	0.0
580	0.0	0.0
581	0.0	0.0
582	0.0	0.0
583	1.26	25.19
584	6.72	47.87
585	13.67	40.56
586	16.20	80.00
587	18.52	80.00
588	25.83	75.83
589	35.15	70.00
590	38.93	77.31
591	41.78	80.00
592	40.00	10.00
593	40.00	20.18
594	40.00	52.78
595	40.00	34.82
596	40.00	30.00
597	40.00	38.33
598	40.00	30.09
599	38.30	100.00
600	40.61	100.00
601	42.00	100.00
602	42.00	100.00
603	42.00	100.00
604	42.00	100.00
605	42.00	100.00
606	42.50	97.50
607	43.19	85.93
608	43.13	85.65
609	44.00	90.00
610	44.00	90.00
611	44.00	80.00
612	44.00	80.00
613	44.70	80.00
614	46.00	74.91
615	46.00	63.34
616	46.00	60.00
617	46.00	60.00
618	44.00	10.00
619	44.00	10.00
620	43.09	10.00
621	42.00	10.00
622	42.00	10.00
623	43.85	19.26
624	50.00	90.00
625	50.00	90.00
626	50.00	90.00
627	50.00	90.00
628	50.00	90.00
629	48.26	90.00
630	48.00	89.73
631	48.37	80.00
632	49.32	80.00
633	48.00	80.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
634	48.00	80.00
635	48.00	80.00
636	48.00	70.28
637	48.00	70.00
638	48.00	70.00
639	48.00	74.44
640	48.00	61.96
641	49.52	50.00
642	50.00	50.00
643	50.00	40.00
644	50.00	44.62
645	50.76	60.00
646	52.00	49.09
647	52.00	40.00
648	52.00	40.00
649	52.04	40.89
650	54.00	90.00
651	54.00	90.00
652	54.00	85.10
653	55.29	73.53
654	56.00	70.00
655	56.00	70.00
656	56.00	60.00
657	56.00	57.23
658	56.00	50.00
659	56.00	38.17
660	56.00	30.00
661	56.00	30.00
662	54.00	39.36
663	54.00	27.79
664	54.00	20.00
665	54.00	20.00
666	54.00	20.00
667	54.00	11.49
668	54.00	0.08
669	54.00	13.31
670	54.00	30.00
671	54.96	30.00
672	57.28	30.00
673	56.41	30.00
674	57.91	30.00
675	58.22	36.60
676	60.00	90.00
677	60.00	90.00
678	60.00	95.82
679	60.00	92.60
680	60.00	90.00
681	60.00	90.00
682	60.42	90.00
683	62.74	90.00
684	65.05	90.00
685	66.00	83.16
686	66.00	71.59
687	66.00	70.00
688	66.00	70.00
689	66.00	73.14
690	66.00	80.00
691	66.00	86.28
692	66.00	90.00
693	66.00	90.00
694	68.20	100.00
695	70.00	100.00
696	70.00	100.00
697	70.00	100.00
698	74.38	100.00
699	76.00	100.00
700	72.09	100.00
701	73.60	100.00
702	72.00	100.00
703	72.00	100.00
704	72.00	100.00
705	72.00	100.00
706	72.00	100.00
707	72.29	100.00
708	73.39	100.00
709	72.92	100.00
710	74.00	100.00
711	74.00	100.00
712	77.73	100.00
713	78.00	100.00
714	77.50	100.00
715	76.00	100.00
716	76.00	100.00
717	76.00	100.00
718	72.49	100.00
719	71.79	100.00
720	67.16	100.00
721	72.70	100.00
722	75.02	100.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
723	73.34	100.00
724	73.64	91.78
725	74.00	31.21
726	78.27	28.63
727	80.00	17.05
728	80.00	5.48
729	80.00	−10.00
730	80.00	−10.00
731	80.00	63.93
732	84.00	80.00
733	85.43	82.39
734	87.62	93.96
735	84.00	100.00
736	84.00	100.00
737	84.00	91.32
738	86.00	100.00
739	86.73	100.00
740	90.00	96.59
741	91.99	90.00
742	94.00	90.00
743	95.63	81.87
744	96.00	89.70
745	100.00	98.72
746	100.57	78.60
747	102.88	50.00
748	104.00	73.99
749	104.00	90.00
750	104.00	25.98
751	103.71	20.00
752	99.54	20.00
753	98.00	20.00
754	99.09	25.44
755	98.60	65.08
756	103.15	80.00
757	100.03	80.00
758	102.35	80.00
759	104.00	73.38
760	104.00	55.11
761	101.42	30.62
762	98.39	11.97
763	57.65	−10.00
764	58.00	−10.00
765	57.45	−10.00
766	56.00	−10.00
767	56.00	−10.00
768	56.00	27.39
769	56.00	40.00
770	56.00	50.00
771	56.00	45.60
772	56.00	33.77
773	56.00	40.00
774	60.15	5.40
775	62.00	−10.00
776	62.00	−10.00
777	62.00	41.64
778	62.00	59.65
779	62.00	75.21
780	62.00	76.36
781	62.00	80.00
782	62.00	80.00
783	62.00	80.00
784	62.00	80.00
785	61.15	80.00
786	60.00	80.00
787	60.00	87.38
788	60.00	90.00
789	60.00	90.00
790	60.00	90.00
791	60.00	90.00
792	60.00	90.00
793	60.00	83.17
794	60.00	80.00
795	60.00	89.97
796	62.31	90.00
797	64.00	86.88
798	64.00	80.00
799	64.00	80.00
800	64.00	80.00
801	64.00	80.00
802	66.00	70.00
803	66.51	70.00
804	68.00	65.87
805	68.00	60.00
806	68.00	60.00
807	73.31	86.55
808	74.00	90.00
809	74.00	90.00
810	73.29	90.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
811	72.00	84.86
812	73.34	73.29
813	74.00	70.00
814	72.03	70.00
815	71.71	50.00
816	70.00	50.00
817	70.00	50.00
818	68.77	56.15
819	68.00	60.00
820	68.00	60.00
821	68.00	58.28
822	68.00	40.00
823	68.00	48.01
824	68.00	60.00
825	68.00	60.00
826	68.00	60.00
827	68.00	60.00
828	68.00	61.87
829	68.00	70.00
830	69.00	70.00
831	70.00	70.00
832	70.00	70.00
833	70.00	70.00
834	70.00	70.00
835	70.00	70.00
836	70.00	70.00
837	73.61	70.00
838	76.00	62.41
839	76.00	60.00
840	76.00	100.00
841	76.92	100.00
842	80.78	100.00
843	82.00	100.00
844	83.40	100.00
845	84.00	100.00
846	83.97	90.00
847	82.35	90.00
848	85.33	93.31
849	89.95	100.00
850	88.13	100.00
851	89.21	100.00
852	95.76	100.00
853	100.23	100.00
854	102.00	100.00
855	104.59	100.00
856	112.71	100.00
857	113.01	100.00
858	112.00	100.00
859	104.00	−10.00
860	103.56	−10.00
861	102.75	−10.00
862	102.94	−10.00
863	99.24	−10.00
864	94.61	−10.00
865	93.99	−10.00
866	92.32	−10.00
867	93.36	−10.00
868	92.00	−10.00
869	90.73	−10.00
870	88.42	−10.00
871	84.21	−10.00
872	82.00	10.00
873	82.00	7.38
874	82.00	−10.00
875	82.00	−10.00
876	68.79	48.69
877	64.00	70.00
878	64.00	70.00
879	58.66	67.95
880	37.27	60.00
881	34.96	60.00
882	32.65	73.54
883	30.33	80.00
884	28.02	80.00
885	25.70	50.00
886	23.39	37.76
887	21.07	10.00
888	18.76	10.00
889	14.89	−10.00
890	12.13	−10.00
891	5.45	−10.00
892	0.0	0.0
893	0.0	0.0
894	0.0	0.0
895	0.0	0.0
896	0.0	0.0
897	0.0	0.0
898	0.0	0.0
899	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
900	0.0	0.0
901	0.0	0.0
902	0.0	0.0
903	0.0	0.0
904	0.0	0.0
905	0.0	0.0
906	0.0	0.0
907	0.0	0.0
908	0.0	0.0
909	0.0	0.0
910	0.0	0.0
911	0.0	0.0
912	0.0	0.0
913	0.0	0.0
914	0.0	0.0
915	0.0	0.0
916	0.0	0.0
917	0.0	0.0
918	0.0	0.0
919	0.0	0.0
920	−1.78	44.40
921	0.0	85.35
922	4.25	100.00
923	27.47	100.00
924	42.96	100.00
925	45.79	100.00
926	48.11	99.46
927	50.42	90.00
928	52.74	75.23
929	54.00	50.00
930	44.42	8.96
931	45.05	−10.00
932	46.00	9.99
933	37.69	−10.00
934	31.61	5.68
935	22.94	35.29
936	24.00	4.87
937	20.86	−10.00
938	12.45	−10.00
939	6.00	−10.00
940	6.52	−10.00
941	7.17	−10.00
942	2.56	−10.00
943	0.0	0.0
944	0.0	0.0
945	0.0	0.0
946	0.0	10.11
947	4.32	46.40
948	8.90	45.17
949	1.95	50.00
950	3.33	41.68
951	4.00	89.46
952	13.76	55.60
953	26.43	26.96
954	33.85	6.16
955	36.00	−10.00
956	34.45	−10.00
957	34.00	−10.00
958	35.64	−10.00
959	32.99	27.39
960	36.00	80.00
961	41.63	74.37
962	60.41	26.76
963	48.44	−10.00
964	43.86	−10.00
965	40.39	−10.00
966	38.50	4.01
967	35.05	30.00
968	40.66	16.70
969	43.64	26.45
970	45.96	−10.00
971	47.10	−10.00
972	49.29	−10.00
973	37.10	−10.00
974	36.00	−10.00
975	34.47	−10.00
976	32.15	−10.00
977	31.67	−10.00
978	28.48	13.89
979	32.38	90.00
980	36.00	90.00
981	41.69	90.00
982	45.74	90.00
983	49.95	80.00
984	49.10	80.00
985	50.59	62.97
986	45.99	34.98
987	42.76	7.23
988	35.12	−10.00

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
989	32.06	67.92
990	35.53	62.55
991	46.57	68.60
992	49.77	48.85
993	52.00	60.00
994	58.06	60.00
995	63.66	23.42
996	64.14	17.84
997	59.58	3.76
998	38.00	42.26
999	39.09	30.00
1000	40.00	30.00
1001	34.85	47.18
1002	32.03	10.33
1003	34.00	33.48
1004	34.00	50.00
1005	33.02	20.69
1006	25.54	−10.00
1007	15.57	−10.00
1008	14.00	−10.00
1009	14.47	27.64
1010	18.00	4.49
1011	17.13	−10.00
1012	16.00	−10.00
1013	10.02	−10.00
1014	9.81	−10.00
1015	5.88	−10.00
1016	4.00	−10.00
1017	4.00	−10.00
1018	2.93	−10.00
1019	0.62	−10.00
1020	0.0	0.0
1021	0.0	0.0
1022	0.0	0.0
1023	0.0	0.0
1024	0.0	0.0
1025	0.0	10.00
1026	0.0	10.00
1027	0.0	29.02
1028	0.0	27.83
1029	0.0	7.34
1030	0.0	0.0
1031	0.0	0.0
1032	0.0	0.0
1033	0.0	0.0
1034	0.0	0.0
1035	0.0	0.0
1036	0.0	0.0
1037	0.0	0.0
1038	0.0	0.0
1039	0.0	0.0
1040	0.0	0.0
1041	2.00	0.0
1042	1.38	0.0
1043	0.0	0.0
1044	0.0	6.27
1045	0.0	2.16
1046	0.0	0.0
1047	0.0	0.0
1048	0.0	0.0
1049	0.83	−10.00
1050	2.00	−10.00
1051	0.54	−10.00
1052	0.0	0.0
1053	0.0	0.0
1054	0.0	0.0
1055	0.0	0.0
1056	0.0	0.0
1057	0.0	0.0
1058	0.0	0.0
1059	0.0	0.0
1060	0.0	0.0
1061	0.0	0.0
1062	0.0	22.01
1063	1.23	72.29
1064	6.63	80.00
1065	17.29	89.29
1066	22.17	90.00
1067	24.00	82.70
1068	24.00	31.96
1069	24.00	−10.00
1070	22.57	−10.00
1071	22.00	−10.00
1072	13.88	−10.00
1073	10.00	−10.00
1074	9.31	−10.00
1075	3.99	−10.00
1076	0.0	0.0
1077	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
1078	0.0	0.0
1079	0.0	0.0
1080	0.0	0.0
1081	0.0	0.0
1082	0.0	0.0
1083	0.0	0.0
1084	0.0	0.0
1085	0.0	0.0
1086	0.0	0.0
1087	0.0	0.0
1088	0.0	0.0
1089	0.0	0.0
1090	0.0	0.0
1091	0.0	0.0
1092	0.0	0.0
1093	0.0	0.0
1094	0.0	0.0
1095	0.0	0.0
1096	0.0	0.0
1097	0.0	0.0
1098	0.0	0.0
1099	−2.52	6.30
1100	−4.22	15.28
1101	0.0	10.00
1102	0.0	10.00
1103	0.0	10.00
1104	0.0	75.93
1105	0.0	32.22
1106	1.67	35.00
1107	15.48	29.82
1108	25.46	−10.00
1109	24.22	−10.00
1110	23.44	−10.00
1111	12.41	80.00
1112	8.94	83.61
1113	7.26	84.82
1114	16.70	80.00
1115	24.67	63.33
1116	0.24	79.81
1117	0.0	8.52
1118	0.0	0.0
1119	0.0	0.0
1120	0.0	0.0
1121	0.0	0.0
1122	0.0	0.0
1123	0.0	0.0
1124	0.0	0.0
1125	0.0	0.0
1126	0.0	0.0
1127	0.0	0.0
1128	0.0	17.59
1129	0.0	19.63
1130	0.0	10.00
1131	0.0	10.00
1132	0.0	10.00
1133	0.0	3.34
1134	0.0	0.0
1135	0.0	0.0
1136	0.0	0.0
1137	0.0	0.0
1138	0.0	0.0
1139	0.0	0.0
1140	0.0	0.0
1141	0.0	0.0
1142	0.0	0.0
1143	0.0	0.0
1144	0.0	0.0
1145	0.0	0.0
1146	0.0	0.0
1147	0.0	0.0
1148	0.0	0.0
1149	0.0	0.0
1150	0.0	0.0
1151	0.0	0.0
1152	0.0	0.0
1153	0.0	0.0
1154	0.0	0.0
1155	0.0	0.0
1156	0.0	0.0
1157	0.0	0.0
1158	0.0	0.0
1159	0.0	0.0
1160	0.0	0.0
1161	0.0	0.0
1162	0.0	0.0
1163	0.0	0.0
1164	0.0	0.0
1165	0.0	0.0
1166	0.0	0.0

Percent Revolutions per Minute and Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per minute	Torque
1167	0.0	0.0

Closed rack.

[2] EPA Engine Dynamometer Schedule For Heavy Duty Diesel Engines

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence

Record (sec)	Revolutions per min	Torque
0	0.0	0.0
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	0.0	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0
11	0.0	0.0
12	0.0	0.0
13	0.0	0.0
14	0.0	0.0
15	0.0	0.0
16	0.0	0.0
17	0.0	0.0
18	0.0	0.0
19	0.0	0.0
20	0.0	0.0
21	0.0	0.0
22	0.0	0.0
23	0.0	0.0
24	0.0	0.0
25	0.0	3.67
26	0.0	47.69
27	3.11	59.41
28	9.09	84.54
29	15.62	80.00
30	33.49	80.00
31	37.93	79.29
32	31.20	38.25
33	21.99	26.67
34	30.00	15.10
35	22.23	16.47
36	19.61	28.05
37	20.00	20.38
38	18.33	(1)
39	6.55	(1)
40	15.82	(1)
41	23.63	(1)
42	17.51	(1)
43	14.19	62.52
44	16.64	69.36
45	27.77	60.00
46	37.03	63.79
47	47.36	75.36
48	54.77	80.00
49	57.70	80.00
50	54.03	79.92
51	58.00	65.03
52	58.65	43.23
53	62.88	50.00
54	69.83	50.00
55	72.00	42.05
56	75.81	40.00
57	84.22	42.20
58	83.86	41.28
59	80.55	(1)
60	80.51	(1)
61	78.00	(1)
62	79.79	(1)
63	80.33	30.54
64	85.58	42.12
65	81.78	50.00
66	78.00	50.00
67	80.74	43.16
68	92.10	73.65
69	88.01	(1)
70	84.00	(1)
71	84.00	(1)

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence—Continued

Record (sec)	Revolutions per min	Torque
72	81.17	(1)
73	70.46	(1)
74	66.00	13.57
75	62.23	29.43
76	64.00	20.00
77	63.48	17.42
78	60.34	10.00
79	56.85	10.00
80	56.00	(1)
81	52.45	(1)
82	39.91	10.00
83	36.38	10.00
84	30.00	10.00
85	27.93	10.00
86	26.00	16.74
87	27.66	3.36
88	28.00	(2)
89	27.41	(1)
90	20.96	(1)
91	12.15	(1)
92	3.81	(1)
93	0.0	0.0
94	0.0	0.0
95	0.0	0.91
96	0.0	7.52
97	0.0	0.0
98	0.0	0.0
99	0.0	0.0
100	0.0	0.0
101	0.0	0.0
102	0.0	0.0
103	0.0	0.0
104	0.0	0.0
105	0.0	0.0
106	0.0	0.0
107	0.0	0.0
108	0.0	0.0
109	0.0	0.0
110	0.0	0.0
111	0.0	0.0
112	0.0	0.0
113	0.0	0.0
114	0.0	0.0
115	0.0	0.0
116	0.0	0.0
117	0.0	0.0
118	0.0	0.0
119	0.0	0.0
120	0.0	0.0
121	0.0	0.0
122	0.0	0.0
123	0.0	0.0
124	0.0	0.0
125	0.0	0.0
126	0.0	0.0
127	0.0	0.0
128	0.0	0.0
129	1.77	(1)
130	1.60	(1)
131	0.0	0.0
132	0.0	0.0
133	2.14	9.28
134	3.08	0.0
135	0.0	0.0
136	0.0	0.0
137	0.0	0.0
138	0.0	0.0
139	0.0	0.0
140	0.0	0.0
141	0.0	0.0
142	0.0	0.0
143	0.0	0.0
144	0.0	0.0
145	0.0	0.0
146	0.0	0.0
147	0.0	5.51
148	0.0	11.34
149	0.0	0.0
150	0.0	0.0
151	0.0	0.0
152	0.0	0.0
153	0.0	0.0
154	0.0	0.0
155	0.0	0.0
156	0.0	0.0
157	0.0	0.0
158	0.0	0.21
159	0.0	30.00

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
160	0.0	26.78
161	0.0	20.00
162	0.0	20.00
163	0.0	4.12
164	0.0	0.0
165	0.0	0.0
166	0.0	0.0
167	0.0	0.0
168	0.0	0.0
169	0.0	0.0
170	0.0	0.0
171	0.0	0.0
172	0.0	0.0
173	0.0	0.0
174	0.0	0.0
175	0.0	0.0
176	0.0	0.0
177	0.0	0.0
178	0.0	0.0
179	0.0	0.0
180	0.0	0.0
181	0.0	0.0
182	0.0	0.0
183	0.0	0.0
184	0.0	20.00
185	0.0	20.00
186	0.0	11.73
187	0.0	0.0
188	0.0	0.0
189	0.0	0.0
190	0.0	0.0
191	0.0	0.0
192	0.0	0.0
193	0.0	0.0
194	0.0	0.0
195	0.0	0.0
196	0.0	0.0
197	0.0	0.0
198	0.0	0.0
199	0.0	0.0
200	0.0	0.0
201	0.0	0.0
202	0.0	0.0
203	0.0	0.0
204	0.0	0.0
205	0.0	0.0
206	0.0	0.0
207	0.0	0.0
208	0.0	0.0
209	0.0	0.0
210	0.0	0.0
211	0.0	0.0
212	0.0	0.0
213	0.0	0.0
214	0.0	73.41
215	0.0	90.00
216	31.30	81.30
217	41.15	90.00
218	44.00	90.00
219	46.41	90.00
220	51.04	82.41
221	66.66	80.00
222	75.03	90.00
223	89.85	90.00
224	96.78	93.88
225	96.91	50.94
226	94.60	17.02
227	99.16	28.60
228	100.00	39.83
229	100.00	30.00
230	100.00	26.69
231	100.98	20.00
232	100.71	20.00
233	100.00	36.06
234	96.16	40.00
235	95.77	30.00
236	94.55	32.75
237	96.86	35.68
238	99.18	30.00
239	100.00	44.93
240	101.81	50.00
241	86.54	(1)
242	63.56	(1)
243	56.00	(1)
244	46.00	(1)
245	41.86	45.18
246	38.31	78.47
247	35.98	80.00

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
248	31.03	80.00
249	25.36	80.00
250	23.05	60.97
251	18.20	27.34
252	12.84	43.71
253	10.10	68.95
254	3.79	68.95
255	1.48	44.28
256	0.0	0.0
257	0.0	0.0
258	0.0	0.0
259	0.0	0.0
260	0.0	0.0
261	0.0	0.0
262	0.0	0.0
263	0.0	24.97
264	0.0	17.16
265	0.0	6.20
266	0.0	10.00
267	0.0	10.00
268	0.0	0.0
269	0.0	0.0
270	0.0	0.0
271	0.0	0.0
272	0.0	0.0
273	0.0	0.0
274	0.0	0.0
275	0.0	0.0
276	0.0	0.0
277	0.0	0.0
278	0.0	0.0
279	0.0	0.0
280	0.0	0.0
281	0.0	0.0
282	0.0	0.0
283	0.0	0.0
284	0.0	0.0
285	0.0	0.0
286	0.0	0.0
287	0.0	0.0
288	0.0	0.0
289	0.0	0.0
290	0.0	0.0
291	0.0	0.0
292	0.0	0.0
293	0.0	0.0
294	0.0	0.0
295	0.0	0.0
296	0.0	0.0
297	0.0	0.0
298	0.0	0.0
299	0.0	0.0
300	0.0	0.0
301	0.0	0.0
302	0.0	0.0
303	0.0	0.0
304	0.0	0.0
305	0.0	0.0
306	0.0	0.0
307	0.0	0.0
308	0.0	0.0
309	0.0	0.0
310	0.0	0.0
311	0.0	0.0
312	0.0	0.0
313	0.0	0.0
314	0.0	0.0
315	0.0	0.0
316	0.0	0.0
317	0.0	0.0
318	0.0	0.0
319	0.0	0.0
320	0.0	0.0
321	0.0	15.55
322	0.0	20.00
323	24.18	19.08
324	23.00	10.00
325	11.56	1.86
326	6.87	(1)
327	6.00	(1)
328	0.72	(1)
329	0.0	0.0
330	0.0	0.0
331	0.0	0.0
332	0.0	0.0
333	0.0	0.0
334	0.0	0.0
335	0.0	0.0

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
336	0.0	0.0
337	0.0	0.0
338	0.0	0.0
339	0.0	0.0
340	0.0	0.0
341	0.0	0.0
342	0.0	0.0
343	0.0	0.0
344	0.0	0.0
345	0.0	0.0
346	0.0	0.0
347	0.0	0.0
348	0.0	0.0
349	0.0	0.0
350	0.0	0.0
351	0.0	0.0
352	0.0	0.0
353	0.0	0.0
354	0.0	0.0
355	0.0	0.0
356	0.0	0.0
357	0.0	0.0
358	0.0	0.0
359	0.0	0.0
360	0.0	0.0
361	0.0	0.0
362	0.0	0.0
363	0.0	0.0
364	0.0	0.0
365	0.0	0.0
366	0.0	0.0
367	0.0	0.0
368	0.0	0.0
369	0.0	0.0
370	0.0	0.0
371	0.0	0.0
372	0.0	0.0
373	0.0	0.0
374	0.0	0.0
375	0.0	0.0
376	0.0	0.0
377	0.0	29.59
378	−1.50	87.46
379	8.88	100.00
380	46.04	100.00
381	76.89	100.00
382	80.00	100.00
383	82.14	94.64
384	85.39	83.07
385	87.70	88.51
386	92.00	79.83
387	92.00	61.66
388	94.58	66.77
389	102.88	60.00
390	106.00	72.76
391	109.18	8.43
392	111.91	(1)
393	82.00	(1)
394	79.33	(1)
395	71.15	(1)
396	68.84	(1)
397	78.35	49.17
398	82.00	70.00
399	80.65	69.46
400	92.85	60.00
401	97.48	60.00
402	98.95	60.00
403	100.74	60.00
404	103.68	43.17
405	104.00	10.04
406	80.62	20.00
407	83.37	20.00
408	81.06	15.29
409	80.00	10.00
410	76.88	(1)
411	74.11	(1)
412	71.60	(1)
413	70.58	(1)
414	78.00	(1)
415	80.29	1.45
416	80.54	17.30
417	78.23	11.13
418	78.45	19.55
419	84.36	24.16
420	72.16	80.00
421	79.10	74.83
422	90.09	16.04
423	74.04	(1)

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
424	68 .02	(1)
425	68.53	(1)
426	59.39	(1)
427	63.54	(1)
428	70.00	2.38
429	73.10	17.76
430	72.13	(1)
431	67.27	(1)
432	36.03	(1)
433	20.75	(1)
434	11.49	(1)
435	−2.09	0.0
436	−0.73	0.0
437	8.57	60.00
438	30.55	61.93
439	67.10	63.00
440	86.03	39.85
441	89.33	30.00
442	91.64	30.00
443	97.88	10.40
444	97.73	1.37
445	96.00	10.00
446	96.00	0.96
447	96.00	(1)
448	85.27	28.34
449	87.54	30.76
450	86.16	29.18
451	88.00	20.00
452	87.21	20.00
453	86.00	20.00
454	87.42	20.00
455	88.00	11.32
456	77.84	(1)
457	72.00	(1)
458	71.32	(1)
459	70.00	0.04
460	70.00	(1)
461	74.88	(1)
462	74.06	(1)
463	67.74	(1)
464	66.00	(1)
465	64.23	(1)
466	62.00	(1)
467	55.94	(1)
468	54.00	(1)
469	66.43	(1)
470	75.21	70.00
471	86.00	54.53
472	86.00	24.56
473	88.81	(1)
474	90.00	(1)
475	105.48	(1)
476	74.00	(1)
477	73.34	(1)
478	71.02	10.00
479	76.46	29.38
480	81.61	40.00
481	78.16	30.39
482	74.13	26.46
483	90.00	0.0
484	90.87	0.0
485	92.00	(1)
486	93.50	(1)
487	94.00	(1)
488	94.13	(1)
489	88.96	(1)
490	63.25	(1)
491	62.00	(1)
492	49.54	45.37
493	52.49	86.99
494	64.00	90.00
495	64.99	90.00
496	71.93	93.22
497	78.87	95.21
498	82.00	83.64
499	86.76	80.00
500	93.71	80.00
501	94.87	80.00
502	103.60	80.00
503	101.23	41.89
504	95.48	24.85
505	98.00	50.00
506	99.79	50.00
507	106.21	46.82
508	110.84	(1)
509	98.55	(1)
510	70.95	(1)
511	67.27	(1)

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
512	60.96	(1)
513	48.03	(1)
514	52.31	(1)
515	54.00	(1)
516	65.27	(1)
517	78.00	(1)
518	57.61	(1)
519	42.58	(1)
520	38.81	(1)
521	22.37	(1)
522	3.52	(1)
523	0.0	0.0
524	−1.46	36.39
525	−0.23	5.75
526	0.0	0.0
527	0.0	0.0
528	0.0	0.0
529	0.0	0.0
530	0.0	0.0
531	0.0	0.0
532	0.0	0.0
533	0.0	0.0
534	0.0	0.0
535	0.0	0.0
536	0.0	0.0
537	0.0	0.0
538	0.0	0.0
539	0.0	0.0
540	0.0	0.0
541	0.0	0.0
542	0.0	0.0
543	0.0	0.0
544	0.0	(1)
545	0.0	0.0
546	−0.75	0.0
547	−0.56	0.0
548	4.00	(1)
549	0.68	(1)
550	0.0	0.0
551	0.0	0.0
552	0.0	2.60
553	0.0	20.00
554	0.0	20.00
555	0.0	7.96
556	0.0	0.0
557	0.0	0.0
558	0.0	78.53
559	1.85	60.00
560	11.10	63.88
561	16.00	70.00
562	30.05	70.00
563	42.88	70.00
564	56.10	70.00
565	63.39	66.52
566	70.66	59.94
567	72.98	80.00
568	77.87	86.46
569	88.03	90.00
570	90.00	90.00
571	92.23	100.00
572	94.00	100.00
573	94.86	100.00
574	96.00	100.00
575	97.49	100.00
576	108.84	100.00
577	110.00	83.92
578	104.77	(1)
579	87.50	(1)
580	90.00	0.0
581	91.38	(1)
582	81.84	(1)
583	65.99	(1)
584	63.68	(1)
585	60.73	(1)
586	57.05	(1)
587	53.47	(1)
588	50.42	(1)
589	44.31	(1)
590	37.58	37.91
591	33.48	20.00
592	31.16	20.00
593	28.85	20.00
594	22.13	20.00
595	9.31	(1)
596	0.0	0.0
597	0.0	0.0
598	0.0	0.0
599	0.0	0.0

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
600	0.0	0.0
601	0.0	0.0
602	0.0	0.0
603	0.0	0.0
604	0.0	0.0
605	0.0	0.0
606	2.52	6.30
607	10.30	17.87
608	13.89	20.00
609	20.20	20.00
610	24.07	22.59
611	33.33	17.50
612	40.30	(1)
613	47.85	(1)
614	66.00	7.78
615	68.00	10.93
616	67.59	32.04
617	66.00	40.00
618	67.04	40.00
619	68.00	40.00
620	68.00	48.33
621	75.93	99.53
622	78.00	100.00
623	78.00	100.00
624	77.07	100.00
625	76.00	100.00
626	76.00	100.00
627	76.00	100.00
628	75.63	100.00
629	73.00	97.50
630	76.81	90.00
631	80.26	90.00
632	83.44	90.00
633	84.00	98.79
634	84.00	100.00
635	83.61	100.00
636	82.00	100.00
637	83.02	94.91
638	86.67	90.00
639	89.65	90.00
640	90.00	99.81
641	89.45	100.00
642	86.00	100.00
643	86.00	95.47
644	87.22	90.00
645	88.00	90.00
646	88.00	80.74
647	88.00	79.17
648	88.00	77.21
649	88.00	100.00
650	88.00	94.45
651	88.00	90.00
652	88.00	90.00
653	90.00	90.00
654	89.63	90.00
655	88.68	90.00
656	90.00	90.00
657	90.00	90.00
658	91.63	81.86
659	92.00	80.00
660	90.00	81.29
661	89.43	92.86
662	87.11	100.00
663	86.00	100.00
664	86.00	100.00
665	89.66	100.00
666	90.00	99.27
667	90.46	90.00
668	92.78	90.00
669	95.09	90.00
670	100.22	82.97
671	102.00	80.00
672	102.00	70.18
673	102.00	80.00
674	97.34	50.07
675	87.02	(1)
676	86.00	(1)
677	73.12	22.19
678	75.77	39.62
679	75.76	48.80
680	75.11	37.23
681	78.00	34.34
682	80.37	40.00
683	77.51	47.49
684	81.44	50.00
685	82.13	39.36
686	84.00	27.79
687	84.00	16.21

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
688	84.00	15.36
689	85.39	26.93
690	86.00	30.00
691	86.00	30.08
692	85.67	40.00
693	84.65	40.00
694	86.00	35.20
695	87.28	30.00
696	88.00	22.05
697	86.09	(1)
698	83.78	(1)
699	81.47	(1)
700	81.70	(1)
701	85.16	(1)
702	84.52	(1)
703	82.21	(1)
704	79.89	(1)
705	77.58	(1)
706	76.00	6.31
707	79.16	0.0
708	75.16	27.36
709	72.00	40.00
710	72.00	40.00
711	74.00	38.44
712	74.00	30.00
713	74.00	30.00
714	74.00	36.28
715	72.43	47.86
716	68.23	59.43
717	73.80	50.00
718	72.52	50.00
719	74.00	45.85
720	72.85	57.18
721	76.38	62.70
722	81.55	60.00
723	80.18	60.00
724	83.60	60.00
725	83.44	56.40
726	86.00	50.00
727	87.35	50.00
728	86.34	50.00
729	86.00	40.11
730	88.29	61.47
731	88.78	63.92
732	88.92	50.00
733	86.76	50.00
734	87.55	42.24
735	88.00	49.34
736	86.00	50.91
737	86.00	67.45
738	86.00	81.88
739	87.13	70.00
740	89.44	77.21
741	91.76	88.78
742	90.07	89.65
743	92.00	80.00
744	92.70	80.00
745	94.00	80.00
746	94.00	80.00
747	94.00	80.00
748	94.00	80.00
749	94.00	81.37
750	94.59	87.05
751	96.00	57.40
752	96.00	42.19
753	96.00	42.33
754	96.00	40.00
755	96.00	38.37
756	96.00	12.83
757	96.00	(1)
758	96.00	(1)
759	96.00	(1)
760	97.74	7.37
761	100.05	19.74
762	102.00	11.83
763	102.00	26.81
764	103.00	49.96
765	104.00	60.00
766	102.37	60.00
767	103.94	60.00
768	104.00	40.00
769	104.00	25.75
770	103.12	(1)
771	100.80	(1)
772	100.00	(1)
773	101.83	44.88
774	102.00	36.40
775	102.00	(1)

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
776	102.00	(1)
777	100.91	(1)
778	101.40	(1)
779	100.28	(1)
780	97.97	(1)
781	96.00	(1)
782	96.00	10.00
783	96.00	0.23
784	96.00	(1)
785	96.00	(1)
786	94.08	(1)
787	78.00	(1)
788	77.45	(1)
789	71.67	28.96
790	67.18	80.00
791	66.50	87.48
792	71.43	90.00
793	74.13	90.00
794	75.56	92.20
795	74.75	100.00
796	77.07	94.65
797	79.38	83.08
798	80.00	71.51
799	80.01	69.93
800	82.33	58.36
801	84.00	50.00
802	84.00	59.58
803	84.00	76.36
804	84.00	80.00
805	84.00	70.49
806	82.00	80.00
807	81.47	82.66
808	80.00	90.00
809	77.68	90.00
810	74.52	75.24
811	77.58	78.96
812	81.89	80.00
813	80.42	80.00
814	82.00	83.68
815	83.05	79.50
816	84.00	70.00
817	84.00	61.60
818	84.00	50.03
819	86.00	60.00
820	86.00	60.00
821	86.00	69.39
822	88.51	73.73
823	88.43	70.00
824	88.00	70.00
825	94.00	70.99
826	94.51	80.00
827	95.17	80.00
828	95.14	80.00
829	94.54	80.00
830	94.00	80.00
831	94.00	77.89
832	94.00	31.99
833	94.00	43.57
834	94.00	60.28
835	94.00	63.29
836	94.00	76.57
837	94.00	89.86
838	94.29	90.00
839	97.80	87.00
840	102.91	80.00
841	104.00	73.85
842	104.00	62.28
843	104.00	69.29
844	106.00	70.00
845	106.00	62.70
846	106.00	40.00
847	104.88	40.00
848	104.00	32.85
849	104.00	30.00
850	104.00	0.30
851	103.63	11.87
852	100.62	13.12
853	98.00	5.01
854	96.68	10.00
855	96.00	(1)
856	96.00	(1)
857	96.00	(1)
858	95.43	(1)
859	94.00	(1)
860	94.00	(1)
861	95.52	5.18
862	97.83	(1)
863	98.00	(1)

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
864	98.00	(1)
865	97.22	(1)
866	96.00	6.35
867	96.00	12.98
868	96.00	10.00
869	95.93	10.00
870	92.00	10.00
871	92.00	10.00
872	92.98	14.89
873	94.00	13.54
874	90.79	42.12
875	88.08	40.40
876	86.23	30.00
877	88.00	32.75
878	87.14	44.32
879	84.82	50.00
880	82.51	50.00
881	82.00	50.00
882	82.12	40.00
883	83.13	35.64
884	80.00	20.00
885	84.26	51.95
886	86.62	66.21
887	84.31	60.00
888	81.99	9.96
889	79.35	1.61
890	75.36	19.56
891	73.05	40.00
892	70.73	8.35
893	68.42	(1)
894	47.15	8.95
895	35.79	10.00
896	32.95	7.38
897	29.16	(1)
898	16.47	(1)
899	2.13	(1)
900	0.0	0.0
901	0.0	0.0
902	0.0	0.0
903	0.0	0.0
904	0.0	0.0
905	0.0	0.0
906	0.0	0.0
907	0.0	0.0
908	0.0	0.0
909	0.0	0.0
910	0.0	0.0
911	0.0	0.0
912	0.0	0.0
913	0.0	0.0
914	0.0	0.0
915	0.0	0.0
916	0.0	0.0
917	0.0	0.0
918	0.0	0.0
919	0.0	0.0
920	0.0	0.0
921	0.0	0.0
922	0.0	0.0
923	0.0	0.0
924	0.0	0.0
925	0.0	0.0
926	0.0	0.0
927	0.0	3.67
928	0.0	47.69
929	3.11	59.41
930	9.09	84.54
931	15.62	80.00
932	33.49	80.00
933	37.93	79.29
934	31.20	38.25
935	21.99	26.67
936	30.00	15.10
937	22.23	16.47
938	19.61	28.05
939	20.00	20.38
940	18.33	(1)
941	6.55	(1)
942	15.82	(1)
943	23.63	(1)
944	17.51	(1)
945	14.19	62.52
946	16.64	69.36
947	27.77	60.00
948	37.03	63.79
949	47.36	75.36

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
950	54.77	80.00
951	54.70	80.00
952	54.03	79.92
953	58.00	65.03
954	58.65	43.23
955	62.88	50.00
956	69.83	50.00
957	72.00	42.05
958	75.81	40.00
959	84.22	42.20
960	83.86	41.28
961	80.55	(1)
962	80.51	(1)
963	78.00	(1)
964	79.79	(1)
965	80.33	30.54
966	85.58	42.12
967	81.78	50.00
968	78.00	50.00
969	80.74	43.16
970	92.10	73.65
971	88.01	(1)
972	84.00	(1)
973	84.00	(1)
974	81.17	(1)
975	70.46	(1)
976	66.00	13.57
977	62.23	29.43
978	64.00	20.00
979	63.48	17.42
980	60.34	10.00
981	56.85	10.00
982	56.00	(1)
983	52.45	(1)
984	39.91	10.00
985	36.38	10.00
986	30.00	10.00
987	27.93	10.00
988	26.00	16.74
989	27.66	3.36
990	28.00	(1)
991	27.41	(1)
992	20.96	(1)
993	12.15	(1)
994	3.81	(1)
995	0.0	0.0
996	0.0	0.0
997	0.0	0.91
998	0.0	7.52
999	0.0	0.0
1000	0.0	0.0
1001	0.0	0.0
1002	0.0	0.0
1003	0.0	0.0
1004	0.0	0.0
1005	0.0	0.0
1006	0.0	0.0
1007	0.0	0.0
1008	0.0	0.0
1009	0.0	0.0
1010	0.0	0.0
1011	0.0	0.0
1012	0.0	0.0
1013	0.0	0.0
1014	0.0	0.0
1015	0.0	0.0
1016	0.0	0.0
1017	0.0	0.0
1018	0.0	0.0
1019	0.0	0.0
1020	0.0	0.0
1021	0.0	0.0
1022	0.0	0.0
1023	0.0	0.0
1024	0.0	0.0
1025	0.0	0.0
1026	0.0	0.0
1027	0.0	0.0
1028	0.0	0.0
1029	0.0	0.0
1030	0.0	0.0
1031	1.77	(1)
1032	1.60	(1)
1033	0.0	0.0
1034	0.0	0.0
1035	2.14	9.28
1036	3.08	0.0
1037	0.0	0.0

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
1038	0.0	0.0
1039	0.0	0.0
1040	0.0	0.0
1041	0.0	0.0
1042	0.0	0.0
1043	0.0	0.0
1044	0.0	0.0
1045	0.0	0.0
1046	0.0	0.0
1047	0.0	0.0
1048	0.0	0.0
1049	0.0	5.51
1050	0.0	11.34
1051	0.0	0.0
1052	0.0	0.0
1053	0.0	0.0
1054	0.0	0.0
1055	0.0	0.0
1056	0.0	0.0
1057	0.0	0.0
1058	0.0	0.0
1059	0.0	0.0
1060	0.0	0.21
1061	0.0	30.00
1062	0.0	26.78
1063	0.0	20.00
1064	0.0	20.00
1065	0.0	4.12
1066	0.0	0.0
1067	0.0	0.0
1068	0.0	0.0
1069	0.0	0.0
1070	0.0	0.0
1071	0.0	0.0
1072	0.0	0.0
1073	0.0	0.0
1074	0.0	0.0
1075	0.0	0.0
1076	0.0	0.0
1077	0.0	0.0
1078	0.0	0.0
1079	0.0	0.0
1080	0.0	0.0
1081	0.0	0.0
1082	0.0	0.0
1083	0.0	0.0
1084	0.0	0.0
1085	0.0	0.0
1086	0.0	20.00
1087	0.0	20.00
1088	0.0	11.73
1089	0.0	0.0
1090	0.0	0.0
1091	0.0	0.0
1092	0.0	0.0
1093	0.0	0.0
1094	0.0	0.0
1095	0.0	0.0
1096	0.0	0.0
1097	0.0	0.0
1098	0.0	0.0
1099	0.0	0.0
1100	0.0	0.0
1101	0.0	0.0
1102	0.0	0.0
1103	0.0	0.0
1104	0.0	0.0
1105	0.0	0.0
1106	0.0	0.0
1107	0.0	0.0
1108	0.0	0.0
1109	0.0	0.0
1110	0.0	0.0
1111	0.0	0.0
1112	0.0	0.0
1113	0.0	0.0
1114	0.0	0.0
1115	0.0	0.0
1116	0.0	73.41
1117	0.0	90.00
1118	31.30	81.30
1119	41.15	90.00
1120	44.00	90.00
1121	46.41	90.00
1122	51.04	82.41
1123	66.66	80.00
1124	75.03	90.00
1125	89.85	90.00

(1) Diesel Engine Percent Revolutions per Minute and Percent Torque Versus Time Sequence— Continued

Record (sec)	Revolutions per min	Torque
1126	96.78	93.88
1127	96.91	50.94
1128	94.60	17.02
1129	99.16	28.60
1130	100.00	39.83
1131	100.00	30.00
1132	100.00	26.69
1133	100.98	20.00
1134	100.71	20.00
1135	100.00	36.06
1136	96.16	40.00
1137	95.77	30.00
1138	94.55	32.75
1139	96.66	35.68
1140	99.18	30.00
1141	100.00	44.93
1142	101.81	50.00
1143	86.54	(1)
1144	63.56	(1)
1145	56.00	(1)
1146	46.00	(1)
1147	41.86	45.18
1148	38.31	78.47
1149	35.98	80.00
1150	31.03	80.00
1151	25.36	80.00
1152	23.05	60.97
1153	18.20	27.34
1154	12.84	43.71
1155	10.10	68.95
1156	3.79	68.95
1157	1.48	44.28
1158	0.0	0.0
1159	0.0	0.0
1160	0.0	0.0
1161	0.0	0.0
1162	0.0	0.0
1163	0.0	0.0
1164	0.0	0.0
1165	0.0	24.97
1166	0.0	17.16
1167	0.0	6.20
1168	0.0	10.00
1169	0.0	10.00
1170	0.0	0.0
1171	0.0	0.0
1172	0.0	0.0
1173	0.0	0.0
1174	0.0	0.0
1175	0.0	0.0
1176	0.0	0.0
1177	0.0	0.0
1178	0.0	0.0
1179	0.0	0.0
1180	0.0	0.0
1181	0.0	0.0
1182	0.0	0.0
1183	0.0	0.0
1184	0.0	0.0
1185	0.0	0.0
1186	0.0	0.0
1187	0.0	0.0
1188	0.0	0.0
1189	0.0	0.0
1190	0.0	0.0
1191	0.0	0.0
1192	0.0	0.0
1193	0.0	0.0
1194	0.0	0.0
1195	0.0	0.0
1196	0.0	0.0
1197	0.0	0.0
1198	0.0	0.0
1199	0.0	0.0

[1] Closed Rack.

26. New Subpart P—Emission Regulations for New Gasoline-Fueled Heavy-Duty Engines and Vehicles; Idle Test Procedures—is added to read as set forth below.

Subpart P—Emission Regulations for New Gasoline-Fueled Heavy-Duty Engines and Vehicles; Idle Test Procedures

Sec.

Authority.—Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act, as amended (42 U.S.C. 7521, 7525, 7541, 7542, and 7601.

Subpart P—Emission Regulations for New Gasoline-Fueled Heavy-Duty Engines and Vehicles; Idle Test Procedures

§ 86.1501–84 Scope; applicability.

This subpart contains gaseous emission idle test procedures for heavy-duty gasoline-fueled engines and vehicles. It applies to 1984 and later model years.

§ 86.1502–84 Definitions.

The definitions in § 86.084–2 apply to this subpart.

§ 86.1503–84 Abbreviations.

The abbreviations in § 86.084–3 apply to this subpart.

§ 86.1504–84 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section 86.1511–84 applies to the 1984 and subsequent model years until superseded. If a section 86.1511–85 is promulgated, it would take effect beginning with the 1985 model year; § 86.1511–83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to gasoline-fueled heavy-duty engines and vehicles.

§ 86.1505–84 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform idle exhaust emission tests on gasoline-fueled heavy-duty engines and vehicles. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1505–84 through 86.1515–84 set forth specifications and equipment requirements; §§ 86.1516–84 through 86.1526–84 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximately chronological order) in §§ 86.1527–84 through 86.1542–84; and calculation formulas are found in § 86.1544–84.

§ 86.1506–84 Equipment required and specifications; overview.

(a) This subpart contains procedures for idle exhaust emission tests on gasoline-fueled heavy-duty vehicles and engines. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All vehicles subject to this subpart are tested for exhaust emissions. Necessary equipment and specifications appear in §§ 86.1509–84 through 86.1511–84.

(2) *Fuel and analytical gas specifications.* Fuel requirements for idle exhaust emission testing are specified in § 86.1513–84. Analytical gases are specified in § 86.1514–84.

§§ 86.1507–84—86.1508–84 [Reserved]

§ 86.1509–84 Exhaust gas sampling system.

(a) The exhaust gas sampling system shall transport the exhaust sample from the engine or vehicle tailpipe to the analysis system in such a manner as to maintain the integrity of the sample constituents that are to be analyzed.

(b) The sample system shall supply a dry sample (i.e., water removed) to the analysis system.

(c) A CVS sampling system with bag analysis as specified in Subpart N is permitted. The inclusion of an additional raw CO_2 analyzer as specified in Subpart D is required if the CVS system is used in order to accurately determine the CVS dilution factor (D.F.). The heated sample line specified in Subpart D for raw emission measurements is not required for the raw CO_2 measurement.

(d) A raw exhaust sampling system as specified in Subpart D is permitted.

§ 86.1510–84 [Reserved]

§ 86.1511–84 Exhaust gas analysis system.

(a) Analyzers used for this subpart shall meet the following specifications.

(1) The analyzers used must have ranges such that

(i) The carbon monoxide (CO) idle standard specified in § 86.083–10 and § 86.083–11 for heavy-duty engines or vehicles will provide an analyzer response between 45 and 90 percent of full-scale deflection on the CO analyzer.

(2) The resolution of the readout device for the ranges specified in paragraph (a)(1) of this section shall be equal to or less than the following:

(i) 0.05 percent for a carbon monoxide analyzer, and

(3) For the ranges specified in paragraph (a)(1) of this section the precision shall be less than ±3 percent of full scale deflection. The precision is defined as 2 times the standard deviation of 5 repetitive responses to a given calibration gas.

(4) For the ranges specified in paragraph (a)(1) of this section, the mean response to a zero calibration gas shall not exceed ±3 percent of full scale during a one-hour period.

(5) For the ranges specified in paragraph (a)(1) of this section the mean calibration response shall be less than ±3 percent of full scale during a one hour period. The calibration response is defined as the analyzer response to a calibration gas after the analyzer has been spanned by the electrical spanning network at the beginning of the one hour period.

(6) The analyzer must respond to an instantaneous step change at the entrance to the sampling system with a response equal to 90 percent of that step change within 15 seconds or less on the ranges specified in paragraph (a)(1) of this section. The step change shall be at least 60 percent of full scale deflection.

(7) The interference gases listed shall individually or collectively produce an analyzer reading less than ±2 percent of full scale on the ranges specified in paragraph (a)(1) of this section.

Interference Gas	Concentration	Applicable analyzer
CO_2	14%	CO
C_3H_8	1%	CO
H_2O	Saturated Vapor at 200° F.	CO
NO_x	1,000 ppm	CO
O_2	5%	CO

(8) The analyzer shall be able to meet the specifications in paragraph (a) of this section.

(i) After a 30 minute warm-up from the prevailing ambient conditions,

(ii) Between the ambient temperatures of −20° C and 45° C (−4° F to 113° F),

(iii) Between 0 to 85 percent relative humidity, and

(iv) During flow variations of ±50 percent.

(b) The following analysis systems are permitted when the analysis system is in a temperature controlled environment.

(1) A CVS sampling system with bag analysis as specified in Subpart N provided suitable corrections are used to convert dilute wet-basis results to raw dry-basis results. The inclusion of an additional raw CO_2 analyzer as specified in Subpart D is required if the CVS system is used in order to accurately determine the CVS dilution factor (D.F.).

(c) A raw exhaust analysis system as specified in Subpart D provided suitable corrections are used to convert raw wet-basis results to raw dry-basis results. Measurements made on a raw dry-basis do not need correction.

§ 86.1512–84 [Reserved]

§ 86.1513–84 Fuel specifications.

Fuel meeting the engine or vehicle manufacturer's recommendations to the ultimate purchaser shall be used. Fuels meeting the specifications in § 86.1313–84 for heavy-duty engines or vehicles are permitted.

§ 86.1514–84 Analytical gases.

(a) *Analyzer gases.*

(1) Calibration gases for the CO analyzer shall be single blends using nitrogen as the diluent.

(2) Ambient air may be used for zero gas provided it is treated to remove impurities or drawn from a source that would tend to minimize CO background levels (e.g., a large room with no vehicles, ambient air, etc.).

(b) Calibration gases shall be traceable to within 3 percent of NBS gas standards, or other standards which have been approved by the Administrator.

(c) Calibration gases shall be equivalent in concentration (±10%) to the standards specified in § 86.083–10 and § 86.083–11 for heavy-duty engines or vehicles.

(d) If the CVS sampling system is used, the analytical gases specified in Subpart N shall be used.

(e) If the raw sampling system (Subpart D) is used, the analytical gases specified in Subpart D shall be used.

§ 86.1515–84 [Reserved]

§ 86.1516–84 Calibration; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1518–84 through 86.1526–84.

(b) At least weekly or after any maintenance which could alter calibration, check the calibration of the CO analyzer. Adjust or repair the analyzer as necessary.

(c) Water traps, filters, or conditioning columns should be checked at least daily.

(d) If the sampling and analysis procedures of Subpart D or N are used, the required calibrations and their frequencies are specified in their respective Subparts.

§§ 86.1517–84—86.1518–84 [Reserved]

§ 86.1519–84 CVS calibration.

If the CVS system is used for sampling during the idle emission test, the calibration instructions are specified in § 86.1319–84 of Subpart N.

§§ 86.1520–84—86.1521–84 [Reserved]

§ 86.1522–84 Carbon monoxide analyzer calibration.

(a) *Initial check.*

(1) Follow the manufacturers instructions for instrument start-up and operation. Adjust the analyzer to optimize performance on the range specified in § 86.1511–84(a)(1).

(2) Calibrate the analyzer with the calibration gas specified in § 86.1514–84(c).

(3) Adjust the electrical span network such that the electrical span point is correct when the analyzer reads the calibration gas correctly.

(4) Determine that the analyzer complies with the specifications in § 86.1511–84.

(b) *Periodic check.* Follow paragraphs (a) (1), (2), and (3) of this section as specified by § 86.1516–84(b). Adjust or repair the analyzer as necessary.

(c) If the analysis procedures of Subpart D or N are used, the required calibrations are specified in their respective Subparts.

§ 86.1523–84 [Reserved]

§ 86.1524–84 Carbon dioxide analyzer calibration.

(a) The calibration requirements for the dilute-sample carbon dioxide analyzer are specified in Subpart N.

(b) The calibration requirements for the raw carbon dioxide analyzer are specified in Subpart D.

(c) If another sampling and analyzing system is used that does not require carbon dioxide (CO_2) analysis, this section may be disregarded.

§ 86.1525–84 [Reserved]

§ 86.1526–84 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.1527–84 Idle test procedure; overview.

(a) The idle emission test procedure is designed to determine the raw concentration (in parts per million of carbon) of carbon monoxide in the exhaust flow at idle. The test procedure begins with a warm engine, required to be at the normal operating temperature. (For example, the warm-up for an engine may be a transient dynamometer test, or for a vehicle it may be any convenient operation).

(b) *Vehicles.*

(1) If the idle test is being performed on a vehicle, all emission control systems shall be intact and functioning.

(c) *Engines.*

(1) If the idle test is being performed on an engine, the required engine configuration is specified in Subpart N.

§ 86.1528–84–86.1529–84 [Reserved]

§ 86.1530–84 Test sequence; general requirements.

The test sequence shown in Figure P83–1 shows the major steps encountered during the idle test described by the subsequent procedures. The average ambient temperature of the engine test cell (in the case of an engine dynamometer test) or the vehicle environment (in the case of a vehicle test) shall be between −20° C and 45° C (−4° F to 113° F).

Start

Engine Warm-up, 5 minutes Min.

Engine Preconditioning, 30 seconds Min., 6 minutes Max.

Idle Stabilization, 30±5 seconds.

Idle Emission Test, 30±5 seconds.

End.

Figure P84–1—Test Sequence

§§ 86.1531-84-86.1536-84 [Reserved]

§ 86.1537-84 Idle test run.

(a) *Test run.* The following steps shall be taken for each test:

(1) Achieve normal engine operating parameters. The transient emission dynamometer test is an acceptable technique to warm-up the engine to normal operating parameters for an engine test. If the transient emission test is not performed prior to the idle emission test, the engine may be warmed-up according to § 86.1332-84(d)(1) (i) through (iii). For a vehicle test, sufficient vehicle operation shall take place to achieve normal operating parameters.

(2) Check the device(s) for removing water from the exhaust sample and the sample filter(s). Remove any water from the water trap(s). Clean and replace the filter(s) as necessary.

(3) Set the zero and span points of the CO analyzer with the electrical spanning network. It is permitted to set the analyzer span with calibration gases.

(4) Hook-up or attach the sampling system to the tailpipe of the engine or vehicle.

(5) Operate the engine at 2500±50 rpm and zero load for a minimum of 30 seconds and a maximum of 6 minutes.

(6) Operate the engine at curb idle for 30±5 seconds with the dynamometer off for the engine test, or the transmission in neutral (or park for automatic transmissions) for the vehicle tests.

(7) Sample the exhaust (after paragraph (a)6 of this section) for an additional 30±5 seconds for raw dry-basis CO in percent. The average value observed during this sample period shall be the value recorded.

(b) If the CVS sampling system is used, the following procedures apply:

(1) Warm-up the engine as specified in paragraph (a)(1) of this section.

(2) Precondition the engine as specified in paragraph (a)(5) of this section.

(3) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan, and the raw CO_2 analyzer. (The heat exchanger of the constant volume sampler, if used, shall be preheated to operating temperature before the test begins).

(5) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(6) Operate the engine at the conditions specified in paragraph (a)(6) of this section.

(7) Begin CO bag sampling and raw CO_2 sampling.

(8) Sample idle emissions long enough to obtain a sufficient bag sample, but in no case shorter than 60 seconds nor longer than 6 minutes. Follow the sampling and exhaust measurements requirements of Subpart D for the conducting of the idle modes of the gasoline or diesel steady-state test for the raw CO_2 measurement.

(9) As soon as possible, transfer the idle test exhaust and dilution air samples to the analytical system and process the samples according to § 86.1540-84 obtaining a stablized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(10) Disconnect the exhaust tube from the engine tailpipe(s).

(11) The CVS may be turned off, if desired.

(c) If the raw exhaust sampling and analysis technique specified in Subpart D is used, the following procedures apply:

(1) Warm-up the engine as specified in paragraph (a)(1) of this section.

(2) Precondition the engine as specified in paragraph (a)(5) of this section.

(3) Operate the engine at the conditions specified in paragraph (a)(6) of this section.

(4) Follow the sampling and exhaust measurement requirements of Subpart D for conducting the idle modes.

(d) If the engine stalls at any time during the test run, the test is void.

§§ 86.1538-84—86.1539-84 [Reserved]

§ 86.1540-84 Idle exhaust sample analysis.

(a) Record the CO idle concentrations in percent.

(b) If the CVS sampling system is used, the analysis procedures for dilute CO and CO_2 specified in Subpart N apply. Follow the raw CO_2 analysis procedure specified in Subpart D for the raw CO_2 analyzer.

(c) If the continuous raw exhaust sampling technique (Subpart D) is used, the analysis procedures for CO specified in Subpart D apply.

§ 86.1541-84 [Reserved]

§ 86.1542-84 Information required.

(a) *General data.* The following information shall be recorded for each idle emission test:

(1) Vehicle identification number for a vehicle test.

(2) Engine identification number for an engine test.

(3) Engine family.

(4) Engine displacement.

(5) Analyzer operator(s).

(6) Vehicle (engine) operator(s).

(7) Fuel identification.

(8) Date of purchase of analytical equipment.

(9) Date of most recent analytical assembly calibration.

(10) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve numbers, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(11) *Pre-test data.*

(i) Date and time of day.

(ii) Test number.

(iii) Ambient temperature (vehicle test) or engine intake air temperature (engine test).

(iv) Vehicle mileage or engine hours as applicable.

(12) *Test data.*

(i) Curb idle speed during the test.

(ii) Idle exhaust CO concentration.

(b) If a CVS sampling system with bag analysis is used for the idle emission test, record the additional information specified in Subpart N as applicable. In addition, record the raw exhaust CO_2 concentration during the test.

(c) If the raw exhaust sampling and analysis system specified in Subpart D is used, record the additional information specified in Subpart D as applicable.

§ 86.1543-84 [Reserved]

§ 86.1544-84 Calculations; idle exhaust emissions.

(a) The final idle emission test results shall be reported as percent for carbon monoxide on a dry basis. The results shall be reported to the same number of significant digits as the idle standards specified in § 86.084-10 and § 86.084-11.

(b) If a CVS sampling system is used, the following procedure shall apply:

(1) Use the procedures, as applicable, in Subpart N to determine the dilute wet-basis CO and CO_2 in percent.

(2) Use the procedure, as applicable, in Subpart D to determine the raw dry-basis CO_2 in percent.

(3) Convert the raw dry-basis CO_2 to raw wet-basis. An assumption that the percent of water by volume in the raw sample is equal to the percent of raw dry-basis CO_2 minus 0.5 percent is acceptable. For example:

10.0% dry $CO_2 - 0.5\% = 9.5\%$ water

$(1.00 - 0.095)$ (10.0% dry CO_2) = 9.05% wet CO_2

(4) Calculate the CVS dilution factor (DF) by:

$$DF = \frac{\text{Raw wet } CO_2 - \text{background } CO_2}{\text{Dilute wet } CO_2 - \text{background } CO_2}$$

(5) Convert the dilute wet-basis CO to dilute dry-basis values. An assumption that the percent of water by volume in the sample bag is 2 percent is acceptable. For example:

dilute dry CO = (dilute wet CO)/(1.00 − 0.02)

(6) Calculate the raw dry-basis CO values by:

raw dry CO = (DF) (dilute dry CO)

(d) If the raw exhaust sampling and analysis system specified in Subpart D is used, the following procedure shall apply:

(1) Use the procedure, as applicable, in Subpart D to raw dry-basis CO and CO_2.

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Monday
January 21, 1980

Part III

Department of the Treasury

Fiscal Service, Bureau of the Public Debt

Offering of U.S. Savings Bonds, Series H Department Circular No. 905, 7th Revision

DEPARTMENT OF THE TREASURY

Fiscal Service

31 CFR Part 332

Offering of U.S. Savings Bonds, Series H

AGENCY: Fiscal Service, Department of the Treasury.

ACTION: Final rule.

SUMMARY: This Seventh Revision of the offering circular for United States Savings Bonds, Series H, i.e., Department of the Treasury Circular No. 905, shows the improvements in the investment yields of Series H bonds. It also makes other changes in the terms of the offering necessitated by the termination of the sale of these bonds on December 31, 1979.

EFFECTIVE DATE: June 1, 1979.

FOR FURTHER INFORMATION CONTACT: A. E. Martin, Office of the Chief Counsel, Bureau of the Public Debt, (202) 376-0636.

SUPPLEMENTAL INFORMATION: On May 10, 1979, the Secretary of the Treasury announced that the interest rate paid on Series H savings bonds would be increased, effective June 1, 1979, to 6.5 percent per annum, compounded semiannually, if held to maturity. This revision of the offering circular for Series H bonds effectuates this increase and provides tables of interest payments and investment yields which reflect the higher rate.

As provided in the revision, this rate increase of ½ of 1 percent per annum is applied as follows:

First, Series H bonds purchased on and after June 1, 1979, will have an investment yield of 6.5 percent per annum, compounded semiannually, if held to original maturity, ten years from issue date. If the bond is redeemed before original maturity, the yield will be less than 6.5 percent.

Second, bonds issued prior to June 1, 1979, whether they are now in their original maturity period or an extended maturity period, will receive a ½ percent increase in investment yield to their original or next maturity date. The increase will be included in the interest check for the semiannual interest period that begins on or after June 1, 1979, and for each semiannual interest period thereafter.

For example: For a bond bearing an issue date of September 1, 1964, its first semiannual interest period after June 1, 1979, began on September 1, 1979. The interest check for that period, which will be issued on March 1, 1980, will be the first check that will reflect the improved yield.

In addition to effectuating the rate increase, this revision of the Series H bond offering circular includes several other changes relating to the termination of sale of the bonds, as announced by the Secretary of the Treasury on January 10, 1979.

First, § 332.1 provides that the offering of Series H bonds will terminate on December 31, 1979.

Second, § 332.8, relating to the extended maturity periods granted to Series H bonds, is revised. The term "extended maturity period" refers to one or more ten-year periods during which Series H bonds, if not sooner redeemed, continue to earn interest after the end of their original maturity period.

In accordance with the Secretary's prior announcement, Series H bonds bearing issue dates of June 1, 1952, through May 1, 1959, which have already been granted two 10-year extensions, will not be extended again. Thus, Series H bonds issued from June 1, 1952, to January 1, 1957, will reach final maturity 29 years, 8 months, from their respective issue dates and will cease to earn interest at that time. Series H bonds issued from February 1, 1957, to May 1, 1959, will reach final maturity exactly 30 years from their respective issue dates. All Series H bonds issued after May 1, 1959, are granted a second 10-year extension.

Finally, several minor changes have been made to the offering to update addresses used in connection with Series H bond transactions.

* * * * *

Accordingly, Department of the Treasury Circular No. 905, Sixth Revision, dated April 19, 1974, as amended and supplemented, including the tables incorporated therein (31 CFR, Part 332), is hereby revised and reissued as Department of the Treasury Circular No. 905, Seventh Revision, effective as of June 1, 1979.

This revision is effected under authority on Section 22 of the Second Liberty Bond Act, as amended (49 Stat. 21, as amended; 31 U.S.C. 757c) and 5 U.S.C. 301. Since this revision involves the fiscal policy of the United States and does not meet the Department's criteria for significant regulations, it has been determined that notice and public procedures thereon are unnecessary.

Dated: January 2, 1980.

Paul H. Taylor,

Fiscal Assistant Secretary.

PART 332—OFFERING OF U.S. SAVINGS BONDS, SERIES H

Sec.

Authority: Sec. 22, Second Liberty Bond Act as amended, 49 Stat. 21, as amended, (31 U.S.C. 757c) and (5 U.S.C. 301).

§ 332.1 Offering of bonds.

The Secretary of the Treasury hereby offers for sale to the people of the United States, United States Savings Bonds of Series H, hereinafter generally referred to as "Series H bonds" or "bonds". This offer, effective as of June 1, 1979, will terminate on December 31, 1979.

§ 332.2 Description of bonds.

(a) *General.* Series H bonds bear a facsimile of the signature of the Secretary of the Treasury and of the Seal of the Department of the Treasury. They are issued only in registered form and are nontransferable.

(b) *Denominations and prices.* Series H bonds are issued at face (par) amount and are available in denominations of $500, $1,000, $5,000 and $10,000.

(c) *Inscription and issue.* At the time of issue the issuing agent will (1) inscribe on the face of each bond the name, social security number and address of the owner, and the name of the beneficiary, if any, or the name, social security number and address of the first-named coowner and the name of the other coowner; (2) enter in the upper right-hand portion of the bond the issue date; and (3) imprint the agent's dating stamp in the lower right-hand portion to show the date the bond is actually inscribed. A bond shall be valid only if an authorized issuing agent receives payment therefor and duly inscribes, dates and stamps it.

(d) *Term.* A Series H bond shall be dated as of the first day of the month in which payment therefor is received by

an agent authorized to issue the bond. This date is the issue date and the bond will mature and be payable 10 years thereafter. The bond may not be called for redemption by the Secretary of the Treasury prior to maturity or the end of any extended maturity period (see § 332.8(a)(1)). The bond may be redeemed at par after six months from issue date.

(e) *Investment yield (interest).* The interest on a Series H bond will be paid semiannually by check drawn to the order of the registered owner or coowners, beginning six months from the issue date. Interest payments will be on a graduated scale, fixed to produce an investment yield of approximately 6.5 percent per annum, compounded semiannually, if the bond is held to maturity, but the yield will be less if the bond is redeemed prior thereto. See Table 56. Interest will cease at the end of the final authorized extended maturity period, or if redeemed earlier, at the end of the interest period next preceding the date of redemption. However, if the date of redemption falls on an interest payment date, interest will cease on that date.

§ 332.3 Governing regulations.

Series H bonds are subject to the regulations of the Department of the Treasury, now or hereafter prescribed governing United States Savings Bonds [of Series A, B, C, D, E, F, G, H, J and K], contained in Department of the Treasury Circular No. 530, current revision (31 CFR, Part 315),[1] except as otherwise specifically provided herein.

§ 332.4 Registration.

(a) *General.* Generally, only residents of the United States, its territories and possessions, the Commonwealth of Puerto Rico, and citizens of the United States temporarily residing abroad are eligible to be named as owners of Series H bonds. The bonds may be registered in the names of natural persons in their own right, as provided in paragraph (b) of this section, and in the names and titles or capacities of fiduciaries and organizations, as provided in paragraph (c) of this section. Full information regarding authorized forms of registration and restrictions with respect thereto are found in the governing regulations.

(b) *Natural persons in their own right.* The bonds may be registered in the names of natural persons (whether adults or minors) in their own right, in single ownership, coownership, and beneficiary forms.

(c) *Others.* The bonds may be registered in single ownership form in the names of fiduciaries and private and public organizations, as follows:

(1) *Fiduciaries.* In the names of and showing the titles or capacities of any persons or organizations, public or private, as fiduciaries (including trustees, legal guardians or similar representatives, and certain custodians), but not where the fiduciary would hold the bonds merely or principally as security for the performance of a duty, obligation or service.

(2) *Private and public organizations.* In the names of private or public organizations (including private corporations, partnerships, and unincorporated associations, and States, counties, public corporations, and other public bodies) in their own right, but not in the names of commercial banks.[2]

§ 332.5 Limitation on holdings.

The amount of Series H bonds originally issued during any one calendar year that may be held by any one person, at any one time, computed in accordance with the governing regulations, is limited as follows:

(a) *General limitation.* $10,000 (face amount) for the calendar year 1974 and each calendar year thereafter.

(b) *Special limitation for gifts to exempt organizations under 26 CFR 1.501(c)(3)–1.* $200,000 (face amount) for bonds received as gifts by an organization which at the time of purchase is an exempt organization under the terms of 26 CFR 1.501(c)(3)–1.

(c) *Exchange pursuant to Department of the Treasury Circular No. 1036, as amended.* Series H bonds issued in an exchange pursuant to the provisions of Department of the Treasury Circular No. 1036 (31 CFR Part 339) are exempt from the annual limitation.

§ 332.6 Purchase of bonds.

(a) *Issuing Agents.* Only the Federal Reserve Banks and Branches and the Department of the Treasury are authorized to act as issuing agents for the sale of Series H bonds. However, financial institutions may forward applications for purchase of the bonds. The date an issuing agent receives the application and payment will govern the issue date of the bond purchased.

(b) *Application for purchase and remittance.* The applicant for purchase of Series H bonds should furnish (1) instructions for registration of the bonds to be issued, which must be in an authorized form; (2) the appropriate social security or employer identification number; (3) the post office address of the owner or first-named coowner; and (4) the address(es) for delivery of the bonds and for mailing checks in payment of interest, if other than that of the owner or first-named coowner. The application should be forwarded to a Federal Reserve Bank or Branch, or the Department of the Treasury, Washington, D.C. 20226, accompanied by a remittance to cover the purchase price. Any form of exchange, including personal checks, will be accepted subject to collection. Checks or other forms of exchange should be drawn to the order of the Federal Reserve Bank or the United States Treasury, as the case may be. Checks payable by endorsement are not acceptable. Any depositary qualified pursuant to Department of the Treasury Circular No. 92, current revision (31 CFR, Part 203), will be permitted to make payment by credit for bonds applied for on behalf of its customers up to any amount for which it shall be qualified in excess of existing deposits when so notified by the Federal Reserve Bank of its district.

§ 332.7 Delivery of bonds.

Authorized issuing agents will deliver Series H bonds either over-the-counter in person, or by mail at the risk and expense of the United States, to the address given by the purchaser, but only within the United States, its territories and possessions, and the Commonwealth of Puerto Rico. No mail deliveries elsewhere will be made. If purchased by citizens of the United States temporarily residing abroad, the bonds will be delivered at such address in the United States as the purchaser directs.

§ 332.8 Extended terms and improved yields for outstanding bonds.

(a) *Extended maturity periods*—(1) *General.* The terms "extended maturity period" and "second extended maturity period", when used herein, refer to 10-year intervals after the original maturity dates during which owners may retain their bonds and continue to earn interest thereon. No special action is required of owners desiring to take advantage of any extensions heretofore or herein granted.[3]

(2) *Two extensions.* All Series H bonds may be retained for two extended maturity periods of 10 years each.

[1] Copies may be obtained from any Federal Reserve Bank or Branch, from the Bureau of the Public Debt, Washington, D.C. 20226, or from the Bureau of the Public Debt, 200 Third Street, Parkersburg, West Virginia 26101.

[2] For this purpose, commercial banks (as defined in § 315.7, Department of the Treasury Circular No. 530, current revision) are those accepting demand deposits.

[3] The tables incorporated herein, arranged according to issue dates, show current schedules of interest payments and investment yields.

(b) *Improved yields*[4]*—Outstanding bonds.* The investment yield on all outstanding Series H bonds is hereby increased as follows:

(1) *Bonds reaching original maturity period on or after December 1, 1979.* By approximately ½ of 1 percent per annum, compounded semiannually, to original maturity, on or after December 1, 1979, the increase to be included in the interest checks issued on or after that date.

(2) *Bonds which entered an extended maturity period prior to December 1, 1979.* By approximately ½ of 1 percent per annum, compounded semiannually, for the remaining period to their next maturity date. The increase will be included in the interest checks issued on or after December 1, 1979.

(3) *Other extensions.* The investment yield for any authorized extensions, other than as set forth in paragraphs (b) (1) or (2) of this section, will be at the rate of 6.5 percent per annum, compounded semiannually, unless such rate is changed prior to the commencement of the extension period. If a change in rate is made, the tables of redemption values and investment yields published herein for such extensions shall not apply.

§ 332.9 Taxation

The income derived from Series H bonds is subject to all taxes imposed under the Internal Revenue Code of 1954. The bonds are subject to estate, inheritance, gift, or other excise taxes, whether Federal or State, but are exempt from all taxation now or hereafter imposed on the principal or interest thereof by any State, or any of the possessions of the United States, or by any local taxing authority.

§ 332.10 Payment or redemption.

A Series H bond may be redeemed at par at any time after six months from the issue date. The bond must be presented and surrendered, with a duly executed request for payment, to (a) a Federal Reserve Bank or Branch, (b) the Department of the Treasury, Washington, D.C. 20226, or (c) the Bureau of the Public Debt, Parkersburg, West Virginia 26101. A bond received by an agent during the calendar month preceding an interest payment date may not be redeemed until that date.

§ 332.11 Reservation as to issue of bonds.

The Secretary of the Treasury reserves the right to reject any application for Series H bonds, in whole or in part, and to refuse to issue or permit to be issued hereunder any such bonds in any case or any class or classes of cases if he deems such action to be in the public interest, and his action in any such respect shall be final.

§ 332.12 Preservation of rights.

Nothing contained herein shall limit or restrict rights which owners of Series H bonds heretofore issued have acquired under offers previously in force.

§ 332.13 Fiscal agents.

Federal Reserve Banks and Branches, as fiscal agents of the United States, are authorized to perform such services as may be requested of them by the Secretary of the Treasury in connection with the issue, delivery, redemption, and payment of Series H bonds.

§ 332.14 Reservations as to terms of offer.

The Secretary of the Treasury may at any time or from time to time supplement or amend the terms of this offering of bonds, or of any amendments or supplements thereto.

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[4] See Appendix for summary of investment yields to maturity, extended maturity and second extended maturity dates under regulations heretofore and herein prescribed.

TABLE 1

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH SEP. 1, 1952

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
7.5 YEARS . . .1/ (8/1/79)	$15.00	$30.00	$150.00	$300.00	5.84	6.00	6.50
8.0 YEARS . . . . (2/1/80)	16.25	32.50	162.50	325.00	5.88	6.50	6.50
8.5 YEARS . . . . (8/1/80)	16.25	32.50	162.50	325.00	5.91	6.50	6.50
9.0 YEARS . . . . (2/1/81)	16.25	32.50	162.50	325.00	5.93	6.50	6.50
9.5 YEARS . . . . (8/1/81)	16.25	32.50	162.50	325.00	5.95	6.50	6.50
10.0 YEARS 2/. . . (2/1/82)	16.25	32.50	162.50	325.00	3/ 5.97	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1952. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.06%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 2

BONDS BEARING ISSUE DATES FROM OCT. 1, 1952 THROUGH MAR. 1, 1953

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
7.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.88	6.00	6.50
7.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.91	6.50	6.50
8.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.94	6.50	6.50
8.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	5.96	6.50	6.50
9.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	5.99	6.50	6.50
9.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.01	6.50	6.50
10.0 YEARS 2/. . . (6/1/82)	16.25	32.50	162.50	325.00	3/ 6.03	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF OCT. 1, 1952. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED OCT. 1 AND NOV. 1, 1952 IS 4.09%; DEC. 1, 1952 THROUGH MAR. 1, 1953 IS 4.10%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 3

BONDS BEARING ISSUE DATES FROM APR. 1 THROUGH SEP. 1, 1953

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
6.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.91	6.00	6.50
7.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.94	6.50	6.50
7.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.97	6.50	6.50
8.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.00	6.50	6.50
8.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.02	6.50	6.50
9.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
9.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
10.0 YEARS 2/. . . (12/1/82)	16.25	32.50	162.50	325.00	3/ 6.08	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF APR. 1, 1953. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: APR. 1 AND MAY 1, 1953 IS 4.14%; JUNE 1 THROUGH SEP. 1, 1953 IS 4.15%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 4

BONDS BEARING ISSUE DATES FROM OCT. 1, 1953 THROUGH MAR. 1, 1954

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
6.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.95	6.00	6.50
6.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.99	6.50	6.50
7.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.02	6.50	6.50
7.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
8.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
8.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
9.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
9.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
10.0 YEARS 2/. . . (6/1/83)	16.25	32.50	162.50	325.00	3/ 6.13	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF OCT. 1, 1953. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: OCT. 1 AND NOV. 1, 1953 IS 4.18%; DEC. 1, 1953 THROUGH MAR. 1, 1954 IS 4.19%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 5

BONDS BEARING ISSUE DATES FROM APR. 1 THROUGH SEP. 1, 1954

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
5.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
6.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
6.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
7.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
7.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
8.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
8.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
9.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
9.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
10.0 YEARS 2/. . . (12/1/83)	16.25	32.50	162.50	325.00	3/ 6.19	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF APR. 1, 1954. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATUPITY DATE ON BONDS DATED: APR. 1 AND MAY 1, 1954 IS 4.22%; JUNE 1 THROUGH SEP. 1, 1954 IS 4.24%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 6

BONDS BEARING ISSUE DATES FROM OCT. 1, 1954 THROUGH MAR. 1, 1955

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
5.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
5.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
6.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.07	6.50	6.50
6.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
7.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
7.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.14	6.50	6.50
8.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
8.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
9.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
9.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
10.0 YEARS 2/. . . (6/1/84)	16.25	32.50	162.50	325.00	3/ 6.21	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF OCT. 1, 1954. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: OCT. 1 AND NOV. 1, 1954 IS 4.27%; DEC. 1, 1954 THROUGH MAR. 1, 1955 IS 4.28%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 7

BONDS BEARING ISSUE DATES FROM APR. 1 THROUGH SEP. 1, 1955

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
4.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
5.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
5.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
6.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
6.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
7.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
7.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
8.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
8.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
9.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
9.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
10.0 YEARS 2/. . . (12/1/84)	16.25	32.50	162.50	325.00	3/ 6.24	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF APR. 1, 1955. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: APR. 1 AND MAY 1, 1955 IS 4.32%; JUNE 1 THROUGH SEP. 1, 1955 IS 4.33%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 8

BONDS BEARING ISSUE DATES FROM OCT. 1, 1955 THROUGH MAR. 1, 1956

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
4.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
4.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.05	6.50	6.50
5.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
5.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
6.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
6.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
7.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
7.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
8.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
8.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
9.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
9.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
10.0 YEARS 2/. . . (6/1/85)	16.25	32.50	162.50	325.00	3/ 6.26	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF OCT. 1, 1955. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: OCT. 1 AND NOV. 1, 1955 IS 4.36%; DEC. 1, 1955 THROUGH MAR. 1, 1956 IS 4.38%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 9

BONDS BEARING ISSUE DATES FROM APR. 1 THROUGH SEP. 1, 1956

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
3.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
4.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
4.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
5.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
5.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
6.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
6.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
7.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
7.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
8.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
8.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
9.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
9.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
10.0 YEARS 2/. . . (12/1/85)	16.25	32.50	162.50	325.00	3/ 6.29	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF APR. 1, 1956. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: APR. 1 AND MAY 1, 1956 IS 4.44%; JUNE 1 THROUGH SEP. 1, 1956 IS 4.45%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 10

BONDS BEARING ISSUE DATES FROM OCT. 1, 1956 THROUGH JAN. 1, 1957

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 19 YEARS, 8 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
3.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
3.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.07	6.50	6.50
4.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
4.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
5.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
5.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
6.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
6.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
7.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
7.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
8.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
8.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.29	6.50	6.50
9.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
9.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
10.0 YEARS 2/. . . (6/1/86)	16.25	32.50	162.50	325.00	3/ 6.32	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF OCT. 1, 1956. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 29 YEARS AND 8 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY DATE ON BONDS DATED: OCT. 1 AND NOV. 1, 1956 IS 4.49%; DEC. 1, 1956 THROUGH JAN. 1, 1957 IS 4.51%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 11

BONDS BEARING ISSUE DATES FROM FEB. 1 THROUGH MAY 1, 1957

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
2.5 YEARS . . .1/ (8/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
3.0 YEARS . . . . (2/1/80)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
3.5 YEARS . . . . (8/1/80)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
4.0 YEARS . . . . (2/1/81)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
4.5 YEARS . . . . (8/1/81)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
5.0 YEARS . . . . (2/1/82)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
5.5 YEARS . . . . (8/1/82)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
6.0 YEARS . . . . (2/1/83)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
6.5 YEARS . . . . (8/1/83)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
7.0 YEARS . . . . (2/1/84)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
7.5 YEARS . . . . (8/1/84)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
8.0 YEARS . . . . (2/1/85)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
8.5 YEARS . . . . (8/1/85)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
9.0 YEARS . . . . (2/1/86)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
9.5 YEARS . . . . (8/1/86)	16.25	32.50	162.50	325.00	6.34	6.50	6.50
10.0 YEARS 2/. . . (2/1/87)	16.25	32.50	162.50	325.00	3/ 6.34	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF FEB. 1, 1957. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.65%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 12

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1957

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
2.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
2.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
3.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
3.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
4.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
4.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
5.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
5.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
6.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
6.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
7.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
7.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.34	6.50	6.50
8.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
8.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
9.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
9.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
10.0 YEARS 2/. . . (6/1/87)	16.25	32.50	162.50	325.00	3/ 6.37	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1957. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.70%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 13

BONDS BEARING ISSUE DATES FROM DEC. 1, 1957 THROUGH MAY 1, 1958

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
1.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
2.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
2.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
3.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
3.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
4.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
4.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
5.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
5.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
6.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
6.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
7.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
7.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.38	6.50	6.50
8.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
8.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
9.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
9.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
10.0 YEARS 2/. . . (12/1/87)	16.25	32.50	162.50	325.00	3/ 6.40	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1957. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.75%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 14

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1958

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * SECOND EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
1.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
1.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
2.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
2.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.29	6.50	6.50
3.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
3.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
4.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
4.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.38	6.50	6.50
5.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
5.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
6.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
6.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
7.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
7.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
8.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
8.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
9.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
9.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
10.0 YEARS 2/. . . (6/1/88)	16.25	32.50	162.50	325.00	3/ 6.43	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1958. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.81%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 15

BONDS BEARING ISSUE DATES FROM DEC. 1, 1958 THROUGH MAY 1, 1959

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
1.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
1.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
2.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
2.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
3.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
3.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
4.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
4.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.44	6.50	6.50
5.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.44	6.50	6.50
5.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
6.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
6.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
7.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
7.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
8.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
8.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
9.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
9.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.47	6.50	6.50
10.0 YEARS 2/. . . (12/1/88)	16.25	32.50	162.50	325.00	3/ 6.47	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1958. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.87%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 16

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1959

ISSUE PRICE / REDEMPTION AND MATURITY VALUE	$500 / 500	$1,000 / 1,000	$5,000 / 5,000	$10,000 / 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
10.0 YEARS 1/, .2/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	3/ 5.68	6.00	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/79)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/89)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

2/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1959. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.58%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.93%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 17

BONDS BEARING ISSUE DATES FROM DEC. 1, 1959 THROUGH MAY 1, 1960

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
9.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.72	6.00	6.50
10.0 YEARS 2/. . . (12/1/79)	16.25	32.50	162.50	325.00	3/ 5.75	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/80)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/89)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1959. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.62%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PUPCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.96%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 18

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1960

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
9.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.77	6.00	6.50
9.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.80	6.50	6.50
10.0 YEARS 2/. . . (6/1/80)	16.25	32.50	162.50	325.00	3/ 5.83	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/80)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/90)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1960. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.66%.
4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 4.99%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 19

BONDS BEARING ISSUE DATES FROM DEC. 1, 1960 THROUGH MAY 1, 1961

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
8.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.80	6.00	6.50
9.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.83	6.50	6.50
9.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.85	6.50	6.50
10.0 YEARS 2/. . . (12/1/80)	16.25	32.50	162.50	325.00	3/ 5.88	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/81)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/90)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1960. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.70%.
4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.02%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 20

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1961

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
8.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.82	6.00	6.50
8.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.85	6.50	6.50
9.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.88	6.50	6.50
9.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	5.90	6.50	6.50
10.0 YEARS 2/. . . (6/1/81)	16.25	32.50	162.50	325.00	3/ 5.92	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1961. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.76%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 20-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1961

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000	(ANNUAL PERCENTAGE RATE)

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/81)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/91)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1961. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.07%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 21

BONDS BEARING ISSUE DATES FROM DEC. 1, 1961 THROUGH MAY 1, 1962

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000	(ANNUAL PERCENTAGE RATE)

PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
7.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.84	6.00	6.50
8.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.88	6.50	6.50
8.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.91	6.50	6.50
9.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	5.93	6.50	6.50
9.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	5.95	6.50	6.50
10.0 YEARS 2/. . . (12/1/81)	16.25	32.50	162.50	325.00	3/ 5.97	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1961. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.81%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 21-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1961 THROUGH MAY 1, 1962

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/82)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/91)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1961. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.11%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 22

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1962

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
7.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.88	6.00	6.50
7.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.91	6.50	6.50
8.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.94	6.50	6.50
8.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	5.96	6.50	6.50
9.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	5.99	6.50	6.50
9.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.01	6.50	6.50
10.0 YEARS 2/. . . (6/1/82)	16.25	32.50	162.50	325.00	3/ 6.03	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1962. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.87%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 22-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1962

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS 1/ (12/1/82)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/92)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1962. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.15%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 23

BONDS BEARING ISSUE DATES FROM DEC. 1, 1962 THROUGH MAY 1, 1963

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
6.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.91	6.00	6.50
7.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.94	6.50	6.50
7.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	5.97	6.50	6.50
8.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.00	6.50	6.50
8.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.02	6.50	6.50
9.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
9.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
10.0 YEARS 2/. . . (12/1/82)	16.25	32.50	162.50	325.00	3/ 6.08	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1962. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.92%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 23-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1962 THROUGH MAY 1, 1963

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/63)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/63)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/64)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/64)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/65)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/65)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/66)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/66)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/67)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/67)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/68)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/68)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/69)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/69)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/70)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/70)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/71)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/71)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/72)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/72)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1962. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.20%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 24

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1963

PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
6.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	5.95	6.00	6.50
6.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	5.99	6.50	6.50
7.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.02	6.50	6.50
7.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
8.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
8.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
9.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
9.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
10.0 YEARS 2/. . . (6/1/83)	16.25	32.50	162.50	325.00	3/ 6.13	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1963. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 4.98%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 24-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1963

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/83)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/93)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1963. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.24%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 25

BONDS BEARING ISSUE DATES FROM DEC. 1, 1963 THROUGH MAY 1, 1964

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
5.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
6.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
6.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.06	6.50	6.50
7.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
7.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
8.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
8.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
9.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
9.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
10.0 YEARS 2/. . . (12/1/83)	16.25	32.50	162.50	325.00	3/ 6.19	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1963. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.04%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 25-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1963 THROUGH MAY 1, 1964

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/84)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/93)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1963. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.29%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 26

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1964

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
5.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
5.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
6.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.07	6.50	6.50
6.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
7.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
7.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.14	6.50	6.50
8.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
8.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
9.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
9.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
10.0 YEARS 2/. . . (6/1/84)	16.25	32.50	162.50	325.00	3/ 6.21	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1964. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.10%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 26-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1964

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/84)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/94)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1964. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.34%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 27

BONDS BEARING ISSUE DATES FROM DEC. 1, 1964 THROUGH MAY 1, 1965

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
4.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
5.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
5.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
6.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
6.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
7.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
7.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
8.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
8.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
9.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
9.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
10.0 YEARS 2/. . . (12/1/84)	16.25	32.50	162.50	325.00	3/ 6.24	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1964. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.16%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 27-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1964 THROUGH MAY 1, 1965

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/85)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/94)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1964. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.39%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 28

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1965

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
4.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
4.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.05	6.50	6.50
5.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
5.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
6.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
6.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
7.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
7.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
8.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
8.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
9.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
9.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
10.0 YEARS 2/. . . (6/1/85)	16.25	32.50	162.50	325.00	3/ 6.26	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1965. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.23%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 28-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1965

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEPEST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/85)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/95)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1965. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.44%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 29

BONDS BEARING ISSUE DATES FROM DEC. 1, 1965 THROUGH MAY 1, 1966

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
3.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
4.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.04	6.50	6.50
4.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.10	6.50	6.50
5.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
5.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
6.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
6.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
7.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.22	6.50	6.50
7.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
8.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
8.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
9.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
9.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
10.0 YEARS 2/. . . (12/1/85)	16.25	32.50	162.50	325.00	3/ 6.29	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1965. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.40%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 29-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1965 THROUGH MAY 1, 1966

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/86)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/95)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1965. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.58%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 30

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1966

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
3.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
3.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.07	6.50	6.50
4.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.11	6.50	6.50
4.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.15	6.50	6.50
5.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.18	6.50	6.50
5.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
6.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
6.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
7.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
7.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
8.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
8.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.29	6.50	6.50
9.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
9.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
10.0 YEARS 2/. . . (6/1/86)	16.25	32.50	162.50	325.00	3/ 6.32	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1966. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.46%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 30-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1966

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/86)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/96)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1966. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.63%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 31

BONDS BEARING ISSUE DATES FROM DEC. 1, 1966 THROUGH MAY 1, 1967

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
2.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
3.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.08	6.50	6.50
3.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.13	6.50	6.50
4.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.17	6.50	6.50
4.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.21	6.50	6.50
5.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
5.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
6.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
6.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
7.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
7.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
8.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
8.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
9.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
9.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.34	6.50	6.50
10.0 YEARS 2/. . . (12/1/86)	16.25	32.50	162.50	325.00	3/ 6.34	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1966. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.52%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 31-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1966 THROUGH MAY 1, 1967

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/87)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/96)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1966. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.68%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 32

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1967

PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
2.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
2.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.09	6.50	6.50
3.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.16	6.50	6.50
3.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.20	6.50	6.50
4.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.23	6.50	6.50
4.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.26	6.50	6.50
5.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.28	6.50	6.50
5.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
6.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.31	6.50	6.50
6.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
7.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
7.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.34	6.50	6.50
8.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
8.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
9.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
9.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
10.0 YEARS 2/. . . (6/1/87)	16.25	32.50	162.50	325.00	3/ 6.37	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1967. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPPIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.59%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 32-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1967

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/87)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/97)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1967. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.74%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 33

BONDS BEARING ISSUE DATES FROM DEC. 1, 1967 THROUGH MAY 1, 1968

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
1.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
2.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.12	6.50	6.50
2.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.19	6.50	6.50
3.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
3.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.27	6.50	6.50
4.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.30	6.50	6.50
4.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
5.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
5.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
6.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
6.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
7.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
7.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.38	6.50	6.50
8.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
8.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
9.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
9.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
10.0 YEARS 2/. . . (12/1/87)	16.25	32.50	162.50	325.00	3/ 6.40	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1967. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.65%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 33-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1967 THROUGH MAY 1, 1968

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/88)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/97)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1967. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.79%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 34

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1968

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION * — EXTENDED MATURITY PERIOD				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
1.0 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
1.5 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.14	6.50	6.50
2.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.24	6.50	6.50
2.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.29	6.50	6.50
3.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.32	6.50	6.50
3.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.35	6.50	6.50
4.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.36	6.50	6.50
4.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.38	6.50	6.50
5.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
5.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
6.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.40	6.50	6.50
6.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
7.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
7.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
8.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
8.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
9.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
9.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
10.0 YEARS 2/. . . (6/1/88)	16.25	32.50	162.50	325.00	3/ 6.43	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1968. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.72%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 34-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1968

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/88)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/98)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1968. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.85%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 35

BONDS BEARING ISSUE DATES FROM DEC. 1, 1968 THROUGH MAY 1, 1969

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/79)	$15.00	$30.00	$150.00	$300.00	6.00	6.00	6.50
1.0 YEARS . . . . (12/1/79)	16.25	32.50	162.50	325.00	6.25	6.50	6.50
1.5 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.33	6.50	6.50
2.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.37	6.50	6.50
2.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.39	6.50	6.50
3.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.41	6.50	6.50
3.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.42	6.50	6.50
4.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.43	6.50	6.50
4.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.44	6.50	6.50
5.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.44	6.50	6.50
5.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
6.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
6.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.45	6.50	6.50
7.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
7.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
8.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
8.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
9.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.46	6.50	6.50
9.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.47	6.50	6.50
10.0 YEARS 2/. . . (12/1/88)	16.25	32.50	162.50	325.00	3/ 6.47	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1968. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.81%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 35-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1968 THROUGH MAY 1, 1969

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO F4. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/89)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/98)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1968. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 5.92%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 36

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1969

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
10.0 YEARS 1/. .2/ (6/1/79)	$16.53	$33.06	$165.30	$330.60	5.67	6.61	----
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS	EXTENDED MATURITY PERIOD **						TO EXTENDED MATURITY
.5 YEARS . . . . (12/1/79)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 3/. . . (6/1/89)	16.25	32.50	162.50	325.00	4/ 6.50	6.50	----

1/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.
2/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1969. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
3/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
4/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 5.96%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 36-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1969

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/89)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
					3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1969. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.05%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 37

BONDS BEARING ISSUE DATES FROM DEC. 1, 1969 THROUGH MAY 1, 1970

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
9.5 YEARS . . .1/ (6/1/79)	$16.72	$33.44	$167.20	$334.40	5.69	6.69	7.19
10.0 YEARS 2/. . . (12/1/79)	17.97	35.94	179.70	359.40	5.75	7.19	----
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS	EXTENDED MATURITY PERIOD **						TO EXTENDED MATURITY
.5 YEARS . . . . (6/1/80)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/80)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 3/. . . (12/1/89)	16.25	32.50	162.50	325.00	4/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1969. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
4/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.01%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 37-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1969 THROUGH MAY 1, 1970

PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
ISSUE PRICE	$500	$1,000	$5,000	$10,000	(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/90)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/99)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1969. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.09%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 38

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1970

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
9.0 YEARS . . .1/ (6/1/79)	$16.26	$32.52	$162.60	$325.20	5.77	6.50	7.00
9.5 YEARS . . . . (12/1/79)	17.51	35.02	175.10	350.20	5.78	7.00	7.00
10.0 YEARS 2/. . . (6/1/80)	17.51	35.02	175.10	350.20	5.83	7.00	----
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS	EXTENDED MATURITY PERIOD **						TO EXTENDED MATURITY
.5 YEARS . . . . (12/1/80)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 3/. . . (6/1/90)	16.25	32.50	162.50	325.00	4/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1970. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

4/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.06%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 38-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1970

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/90)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/ 0)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1970. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.13%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 39

BONDS BEARING ISSUE DATES FROM DEC. 1, 1970 THROUGH MAY 1, 1971

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
6.5 YEARS . . .1/ (6/1/79)	$16.26	$32.52	$162.60	$325.20	5.73	6.50	7.00
9.0 YEARS . . . . (12/1/79)	17.51	35.02	175.10	350.20	5.78	7.00	7.00
9.5 YEARS . . . . (6/1/80)	17.51	35.02	175.10	350.20	5.83	7.00	7.00
10.0 YEARS 2/. . . (12/1/80)	17.51	35.02	175.10	350.20	5.87	7.00	----
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS	EXTENDED MATURITY PERIOD **						TO EXTENDED MATURITY
.5 YEARS . . . . (6/1/81)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/81)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 3/. . . (12/1/90)	16.25	32.50	162.50	325.00	4/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1970. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

4/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.09%.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 39-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1970 THROUGH MAY 1, 1971

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — SECOND EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO 2ND EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/91)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/ 0)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1970. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.16%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 40

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1971

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
8.0 YEARS . . .1/ (6/1/79)	$16.26	$32.52	$162.60	$325.20	5.72	6.50	7.00
8.5 YEARS . . . . (12/1/79)	17.51	35.02	175.10	350.20	5.78	7.00	7.00
9.0 YEARS . . . . (6/1/80)	17.51	35.02	175.10	350.20	5.83	7.00	7.00
9.5 YEARS . . . . (12/1/80)	17.51	35.02	175.10	350.20	5.88	7.00	7.00
10.0 YEARS 2/. . . (6/1/81)	17.51	35.02	175.10	350.20	5.92	7.00	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1971. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 40-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1971

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/81)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . (6/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/91)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/91)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 1)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1971. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.12%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.18%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 41

BONDS BEARING ISSUE DATES FROM DEC. 1, 1971 THROUGH MAY 1, 1972

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
7.5 YEARS . . .1/ (6/1/79)	$16.26	$32.52	$162.60	$325.20	5.72	6.50	7.00
8.0 YEARS . . . . (12/1/79)	17.51	35.02	175.10	350.20	5.78	7.00	7.00
8.5 YEARS . . . . (6/1/80)	17.51	35.02	175.10	350.20	5.84	7.00	7.00
9.0 YEARS . . . . (12/1/80)	17.51	35.02	175.10	350.20	5.89	7.00	7.00
9.5 YEARS . . . . (6/1/81)	17.51	35.02	175.10	350.20	5.93	7.00	7.00
10.0 YEARS 2/. . . (12/1/81)	17.51	35.02	175.10	350.20	5.97	7.00	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1971. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 41-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1971 THROUGH MAY 1, 1972

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/82)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/82)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/91)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/92)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 1)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1971. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.15%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.21%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 42

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1972

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
7.0 YEARS . . .1/ (6/1/79)	$16.27	$32.54	$162.70	$325.40	5.71	6.51	7.01
7.5 YEARS . . . . (12/1/79)	17.52	35.04	175.20	350.40	5.78	7.01	7.01
8.0 YEARS . . . . (6/1/80)	17.52	35.04	175.20	350.40	5.84	7.01	7.01
8.5 YEARS . . . . (12/1/80)	17.52	35.04	175.20	350.40	5.90	7.01	7.01
9.0 YEARS . . . . (6/1/81)	17.52	35.04	175.20	350.40	5.94	7.01	7.01
9.5 YEARS . . . . (12/1/81)	17.52	35.04	175.20	350.40	5.99	7.01	7.01
10.0 YEARS 2/. . . (6/1/82)	17.52	35.04	175.20	350.40	6.02	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1972. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.
2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 42-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1972

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/82)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/92)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/92)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 2)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1972. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.19%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.24%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 43

BONDS BEARING ISSUE DATES FROM DEC. 1, 1972 THROUGH MAY 1, 1973

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
6.5 YEARS . . .1/ (6/1/79)	$16.27	$32.54	$162.70	$325.40	5.71	6.51	7.01
7.0 YEARS . . . . (12/1/79)	17.52	35.04	175.20	350.40	5.78	7.01	7.01
7.5 YEARS . . . . (6/1/80)	17.52	35.04	175.20	350.40	5.85	7.01	7.01
8.0 YEARS . . . . (12/1/80)	17.52	35.04	175.20	350.40	5.91	7.01	7.01
8.5 YEARS . . . . (6/1/81)	17.52	35.04	175.20	350.40	5.96	7.01	7.01
9.0 YEARS . . . . (12/1/81)	17.52	35.04	175.20	350.40	6.00	7.01	7.01
9.5 YEARS . . . . (6/1/82)	17.52	35.04	175.20	350.40	6.04	7.01	7.01
10.0 YEARS 2/. . . (12/1/82)	17.52	35.04	175.20	350.40	6.07	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1972. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 43-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1972 THROUGH MAY 1, 1973

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/83)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/83)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/92)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/93)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 2)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1972. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.22%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.27%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE #4

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1973

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
6.0 YEARS . . .1/ (6/1/79)	$16.27	$32.54	$162.70	$325.40	5.70	6.51	7.01
6.5 YEARS . . . . (12/1/79)	17.52	35.04	175.20	350.40	5.78	7.01	7.01
7.0 YEARS . . . . (6/1/80)	17.52	35.04	175.20	350.40	5.85	7.01	7.01
7.5 YEARS . . . . (12/1/80)	17.52	35.04	175.20	350.40	5.92	7.01	7.01
8.0 YEARS . . . . (6/1/81)	17.52	35.04	175.20	350.40	5.97	7.01	7.01
8.5 YEARS . . . . (12/1/81)	17.52	35.04	175.20	350.40	6.02	7.01	7.01
9.0 YEARS . . . . (6/1/82)	17.52	35.04	175.20	350.40	6.06	7.01	7.01
9.5 YEARS . . . . (12/1/82)	17.52	35.04	175.20	350.40	6.09	7.01	7.01
10.0 YEARS 2/. . . (6/1/83)	17.52	35.04	175.20	350.40	6.13	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1973. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 44-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1973

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
	EXTENDED MATURITY PERIOD **						
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/83)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . . (6/1/93)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/93)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . . (6/1/ 3)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1973. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.26%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.29%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 45

BONDS BEARING ISSUE DATES FROM DEC. 1, 1973 THROUGH MAY 1, 1974

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
5.5 YEARS . . .1/ (6/1/79)	$16.28	$32.56	$162.80	$325.60	5.69	6.51	7.01
6.0 YEARS . . . . (12/1/79)	17.53	35.06	175.30	350.60	5.78	7.01	7.01
6.5 YEARS . . . . (6/1/80)	17.53	35.06	175.30	350.60	5.86	7.01	7.01
7.0 YEARS . . . . (12/1/80)	17.53	35.06	175.30	350.60	5.93	7.01	7.01
7.5 YEARS . . . . (6/1/81)	17.53	35.06	175.30	350.60	5.99	7.01	7.01
8.0 YEARS . . . . (12/1/81)	17.53	35.06	175.30	350.60	6.04	7.01	7.01
8.5 YEARS . . . . (6/1/82)	17.53	35.06	175.30	350.60	6.08	7.01	7.01
9.0 YEARS . . . . (12/1/82)	17.53	35.06	175.30	350.60	6.12	7.01	7.01
9.5 YEARS . . . . (6/1/83)	17.53	35.06	175.30	350.60	6.15	7.01	7.01
10.0 YEARS 2/. . . (12/1/83)	17.53	35.06	175.30	350.60	6.18	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1973. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 45-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1973 THROUGH MAY 1, 1974

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/84)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/84)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/93)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/94)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 3)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1973. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.29%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.33%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 46

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1974

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
5.0 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.67	5.80	7.01
5.5 YEARS . . . . (12/1/79)	17.53	35.06	175.30	350.60	5.73	7.01	7.01
6.0 YEARS . . . . (6/1/80)	17.53	35.06	175.30	350.60	5.82	7.01	7.01
6.5 YEARS . . . . (12/1/80)	17.53	35.06	175.30	350.60	5.89	7.01	7.01
7.0 YEARS . . . . (6/1/81)	17.53	35.06	175.30	350.60	5.96	7.01	7.01
7.5 YEARS . . . . (12/1/81)	17.53	35.06	175.30	350.60	6.02	7.01	7.01
8.0 YEARS . . . . (6/1/82)	17.53	35.06	175.30	350.60	6.06	7.01	7.01
8.5 YEARS . . . . (12/1/82)	17.53	35.06	175.30	350.60	6.11	7.01	7.01
9.0 YEARS . . . . (6/1/83)	17.53	35.06	175.30	350.60	6.14	7.01	7.01
9.5 YEARS . . . . (12/1/83)	17.53	35.06	175.30	350.60	6.18	7.01	7.01
10.0 YEARS 2/. . . (6/1/84)	17.53	35.06	175.30	350.60	6.21	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1974. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 46-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1974

ISSUE PRICE / REDEMPTION AND MATURITY VALUE	$500 / 500	$1,000 / 1,000	$5,000 / 5,000	$10,000 / 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
	EXTENDED MATURITY PERIOD **						
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/84)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/94)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/94)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 4)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1974. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.31%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.34%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 47

BONDS BEARING ISSUE DATES FROM DEC. 1, 1974 THROUGH MAY 1, 1975

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
4.5 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.60	5.80	6.94
5.0 YEARS . . . . (12/1/79)	15.75	31.50	157.50	315.00	5.64	6.30	7.01
5.5 YEARS . . . . (6/1/80)	17.53	35.06	175.30	350.60	5.77	7.01	7.01
6.0 YEARS . . . . (12/1/80)	17.53	35.06	175.30	350.60	5.86	7.01	7.01
6.5 YEARS . . . . (6/1/81)	17.53	35.06	175.30	350.60	5.93	7.01	7.01
7.0 YEARS . . . . (12/1/81)	17.53	35.06	175.30	350.60	5.99	7.01	7.01
7.5 YEARS . . . . (6/1/82)	17.53	35.06	175.30	350.60	6.05	7.01	7.01
8.0 YEARS . . . . (12/1/82)	17.53	35.06	175.30	350.60	6.09	7.01	7.01
8.5 YEARS . . . . (6/1/83)	17.53	35.06	175.30	350.60	6.13	7.01	7.01
9.0 YEARS . . . . (12/1/83)	17.53	35.06	175.30	350.60	6.17	7.01	7.01
9.5 YEARS . . . . (6/1/84)	17.53	35.06	175.30	350.60	6.20	7.01	7.01
10.0 YEARS 2/. . . (12/1/84)	17.53	35.06	175.30	350.60	6.23	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1974. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 47-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1974 THROUGH MAY 1, 1975

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/85)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/85)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/94)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/95)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 4)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1974. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.33%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.35%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 48

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1975

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000	(ANNUAL PERCENTAGE RATE)

PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
4.0 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.58	5.80	6.87
4.5 YEARS . . . . (12/1/79)	15.75	31.50	157.50	315.00	5.65	6.30	6.94
5.0 YEARS . . . . (6/1/80)	15.75	31.50	157.50	315.00	5.71	6.30	7.01
5.5 YEARS . . . . (12/1/80)	17.53	35.06	175.30	350.60	5.81	7.01	7.01
6.0 YEARS . . . . (6/1/81)	17.53	35.06	175.30	350.60	5.89	7.01	7.01
6.5 YEARS . . . . (12/1/81)	17.53	35.06	175.30	350.60	5.97	7.01	7.01
7.0 YEARS . . . . (6/1/82)	17.53	35.06	175.30	350.60	6.03	7.01	7.01
7.5 YEARS . . . . (12/1/82)	17.53	35.06	175.30	350.60	6.08	7.01	7.01
8.0 YEARS . . . . (6/1/83)	17.53	35.06	175.30	350.60	6.12	7.01	7.01
8.5 YEARS . . . . (12/1/83)	17.53	35.06	175.30	350.60	6.16	7.01	7.01
9.0 YEARS . . . . (6/1/84)	17.53	35.06	175.30	350.60	6.20	7.01	7.01
9.5 YEARS . . . . (12/1/84)	17.53	35.06	175.30	350.60	6.23	7.01	7.01
10.0 YEARS 2/. . . (6/1/85)	17.53	35.06	175.30	350.60	6.26	7.01	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1975. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 48-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1975

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/85)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/95)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/95)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 5)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1975. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.34%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.37%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE A9

BONDS BEARING ISSUE DATES FROM DEC. 1, 1975 THROUGH MAY 1, 1976

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
3.5 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.55	5.80	6.82
4.0 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.64	6.30	6.88
4.5 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.70	6.30	6.94
5.0 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	7.02
5.5 YEARS . . . . (6/1/81)	17.54	35.08	175.40	350.80	5.85	7.02	7.02
6.0 YEARS . . . . (12/1/81)	17.54	35.08	175.40	350.80	5.93	7.02	7.02
6.5 YEARS . . . . (6/1/82)	17.54	35.08	175.40	350.80	6.00	7.02	7.02
7.0 YEARS . . . . (12/1/82)	17.54	35.08	175.40	350.80	6.06	7.02	7.02
7.5 YEARS . . . . (6/1/83)	17.54	35.08	175.40	350.80	6.11	7.02	7.02
8.0 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.16	7.02	7.02
8.5 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.20	7.02	7.02
9.0 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.23	7.02	7.02
9.5 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.26	7.02	7.02
10.0 YEARS 2/. . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1975. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 49-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1975 THROUGH MAY 1, 1976

ISSUE PRICE / REDEMPTION AND MATURITY VALUE	$500 / 500	$1,000 / 1,000	$5,000 / 5,000	$10,000 / 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
	EXTENDED MATURITY PERIOD **						
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/86)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/86)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/95)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/96)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 5)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1975. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.36%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.38%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 50

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1976

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
3.0 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.51	5.80	6.78
3.5 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.62	6.30	6.82
4.0 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.70	6.30	6.88
4.5 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.94
5.0 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.80	6.30	7.02
5.5 YEARS . . . . (12/1/81)	17.54	35.08	175.40	350.80	5.90	7.02	7.02
6.0 YEARS . . . . (6/1/82)	17.54	35.08	175.40	350.80	5.98	7.02	7.02
6.5 YEARS . . . . (12/1/82)	17.54	35.08	175.40	350.80	6.04	7.02	7.02
7.0 YEARS . . . . (6/1/83)	17.54	35.08	175.40	350.80	6.10	7.02	7.02
7.5 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.15	7.02	7.02
8.0 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.19	7.02	7.02
8.5 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.23	7.02	7.02
9.0 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.26	7.02	7.02
9.5 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
10.0 YEARS 2/. . . (6/1/86)	17.54	35.08	175.40	350.80	6.31	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1976. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 50-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1976

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
	EXTENDED MATURITY PERIOD **						
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/86)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/96)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/96)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 6)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1976. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.38%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.40%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 51

BONDS BEARING ISSUE DATES FROM DEC. 1, 1976 THROUGH MAY 1, 1977

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
2.5 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.46	5.80	6.74
3.0 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.59	6.30	6.78
3.5 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.69	6.30	6.82
4.0 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.88
4.5 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.81	6.30	6.94
5.0 YEARS . . . . (12/1/81)	15.76	31.52	157.60	315.20	5.85	6.30	7.02
5.5 YEARS . . . . (6/1/82)	17.54	35.08	175.40	350.80	5.94	7.02	7.02
6.0 YEARS . . . . (12/1/82)	17.54	35.08	175.40	350.80	6.02	7.02	7.02
6.5 YEARS . . . . (6/1/83)	17.54	35.08	175.40	350.80	6.08	7.02	7.02
7.0 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.13	7.02	7.02
7.5 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.18	7.02	7.02
8.0 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.22	7.02	7.02
8.5 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.26	7.02	7.02
9.0 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
9.5 YEARS . . . . (6/1/86)	17.54	35.08	175.40	350.80	6.32	7.02	7.02
10.0 YEARS 2/. . . (12/1/86)	17.54	35.08	175.40	350.80	6.34	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1976. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 51-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1976 THROUGH MAY 1, 1977

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/87)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/87)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/96)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/97)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 6)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1976. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.40%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.41%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 52

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1977

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTERFST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
2.0 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.38	5.80	6.70
2.5 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.56	6.30	6.74
3.0 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.67	6.30	6.78
3.5 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.82
4.0 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.82	6.30	6.88
4.5 YEARS . . . . (12/1/81)	15.76	31.52	157.60	315.20	5.86	6.30	6.94
5.0 YEARS . . . . (6/1/82)	15.76	31.52	157.60	315.20	5.90	6.30	7.02
5.5 YEARS . . . . (12/1/82)	17.54	35.08	175.40	350.80	5.99	7.02	7.02
6.0 YEARS . . . . (6/1/83)	17.54	35.08	175.40	350.80	6.06	7.02	7.02
6.5 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.12	7.02	7.02
7.0 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.17	7.02	7.02
7.5 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.22	7.02	7.02
8.0 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.26	7.02	7.02
8.5 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
9.0 YEARS . . . . (6/1/86)	17.54	35.08	175.40	350.80	6.32	7.02	7.02
9.5 YEARS . . . . (12/1/86)	17.54	35.08	175.40	350.80	6.35	7.02	7.02
10.0 YEARS 2/. . . (6/1/87)	17.54	35.08	175.40	350.80	6.37	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1977. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 52-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1977

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/87)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/97)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/97)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 7)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1977. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.42%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.43%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 53

BONDS BEARING ISSUE DATES FROM DEC. 1, 1977 THROUGH MAY 1, 1978

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
1.5 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	5.25	5.80	6.67
2.0 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.50	6.30	6.70
2.5 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.66	6.30	6.74
3.0 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.78
3.5 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.83	6.30	6.82
4.0 YEARS . . . . (12/1/81)	15.76	31.52	157.60	315.20	5.88	6.30	6.88
4.5 YEARS . . . . (6/1/82)	15.76	31.52	157.60	315.20	5.92	6.30	6.94
5.0 YEARS . . . . (12/1/82)	15.76	31.52	157.60	315.20	5.96	6.30	7.02
5.5 YEARS . . . . (6/1/83)	17.54	35.08	175.40	350.80	6.04	7.02	7.02
6.0 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.11	7.02	7.02
6.5 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.16	7.02	7.02
7.0 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.21	7.02	7.02
7.5 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.25	7.02	7.02
8.0 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
8.5 YEARS . . . . (6/1/86)	17.54	35.08	175.40	350.80	6.32	7.02	7.02
9.0 YEARS . . . . (12/1/86)	17.54	35.08	175.40	350.80	6.35	7.02	7.02
9.5 YEARS . . . . (6/1/87)	17.54	35.08	175.40	350.80	6.38	7.02	7.02
10.0 YEARS 2/. . . (12/1/87)	17.54	35.08	175.40	350.80	6.40	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1977. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEPEST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 53-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1977 THROUGH MAY 1, 1978

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
	EXTENDED MATURITY PERIOD **						
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/88)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/88)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/97)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/98)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 7)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1977. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.43%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.44%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 5A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1978

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION *				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
1.0 YEARS . . .1/ (6/1/79)	$14.50	$29.00	$145.00	$290.00	4.99	5.80	6.65
1.5 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.42	6.30	6.67
2.0 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.63	6.30	6.70
2.5 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.74
3.0 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.84	6.30	6.78
3.5 YEARS . . . . (12/1/81)	15.76	31.52	157.60	315.20	5.90	6.30	6.82
4.0 YEARS . . . . (6/1/82)	15.76	31.52	157.60	315.20	5.95	6.30	6.88
4.5 YEARS . . . . (12/1/82)	15.76	31.52	157.60	315.20	5.98	6.30	6.94
5.0 YEARS . . . . (6/1/83)	15.76	31.52	157.60	315.20	6.01	6.30	7.02
5.5 YEARS . . . . (12/1/83)	17.54	35.08	175.40	350.80	6.09	7.02	7.02
6.0 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.15	7.02	7.02
6.5 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.21	7.02	7.02
7.0 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.25	7.02	7.02
7.5 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
8.0 YEARS . . . . (6/1/86)	17.54	35.08	175.40	350.80	6.33	7.02	7.02
8.5 YEARS . . . . (12/1/86)	17.54	35.08	175.40	350.80	6.36	7.02	7.02
9.0 YEARS . . . . (6/1/87)	17.54	35.08	175.40	350.80	6.39	7.02	7.02
9.5 YEARS . . . . (12/1/87)	17.54	35.08	175.40	350.80	6.41	7.02	7.02
10.0 YEARS 2/. . . (6/1/88)	17.54	35.08	175.40	350.80	6.43	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1978. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

* FOR EARLIER INTEREST CHECKS AND YIELDS SEE APPROPRIATE TABLE IN DEPARTMENT CIRCULAR 905, 6TH REVISION, AS AMENDED AND SUPPLEMENTED.

TABLE 54-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1978

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/88)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/98)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/98)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 8)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1978. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.46%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.46%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 55

BONDS BEARING ISSUE DATES FROM DEC. 1, 1978 THROUGH MAY 1, 1979

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/79)	$10.50	$21.00	$105.00	$210.00	4.20	4.20	6.62
1.0 YEARS . . . . (12/1/79)	15.76	31.52	157.60	315.20	5.24	6.30	6.65
1.5 YEARS . . . . (6/1/80)	15.76	31.52	157.60	315.20	5.58	6.30	6.67
2.0 YEARS . . . . (12/1/80)	15.76	31.52	157.60	315.20	5.76	6.30	6.70
2.5 YEARS . . . . (6/1/81)	15.76	31.52	157.60	315.20	5.86	6.30	6.74
3.0 YEARS . . . . (12/1/81)	15.76	31.52	157.60	315.20	5.93	6.30	6.78
3.5 YEARS . . . . (6/1/82)	15.76	31.52	157.60	315.20	5.98	6.30	6.82
4.0 YEARS . . . . (12/1/82)	15.76	31.52	157.60	315.20	6.01	6.30	6.88
4.5 YEARS . . . . (6/1/83)	15.76	31.52	157.60	315.20	6.04	6.30	6.94
5.0 YEARS . . . . (12/1/83)	15.76	31.52	157.60	315.20	6.06	6.30	7.02
5.5 YEARS . . . . (6/1/84)	17.54	35.08	175.40	350.80	6.14	7.02	7.02
6.0 YEARS . . . . (12/1/84)	17.54	35.08	175.40	350.80	6.20	7.02	7.02
6.5 YEARS . . . . (6/1/85)	17.54	35.08	175.40	350.80	6.25	7.02	7.02
7.0 YEARS . . . . (12/1/85)	17.54	35.08	175.40	350.80	6.29	7.02	7.02
7.5 YEARS . . . . (6/1/86)	17.54	35.08	175.40	350.80	6.33	7.02	7.02
8.0 YEARS . . . . (12/1/86)	17.54	35.08	175.40	350.80	6.37	7.02	7.02
8.5 YEARS . . . . (6/1/87)	17.54	35.08	175.40	350.80	6.39	7.02	7.02
9.0 YEARS . . . . (12/1/87)	17.54	35.08	175.40	350.80	6.42	7.02	7.02
9.5 YEARS . . . . (6/1/88)	17.54	35.08	175.40	350.80	6.44	7.02	7.02
10.0 YEARS 2/. . . (12/1/88)	17.54	35.08	175.40	350.80	6.46	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1978. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

TABLE 55-A

BONDS BEARING ISSUE DATES FROM DEC. 1, 1978 THROUGH MAY 1, 1979

ISSUE PRICE	$500	$1,000	$5,000	$10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
REDEMPTION AND MATURITY VALUE	500	1,000	5,000	10,000			
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION — EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/89)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/89)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/98)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/99)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 8)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 8)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1978. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.48%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.48%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 5A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1979

ISSUE PRICE REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/79)	$11.77	$23.54	$117.70	$235.40	4.71	4.71	6.63
1.0 YEARS . . . . (6/1/80)	15.77	31.54	157.70	315.40	5.50	6.31	6.65
1.5 YEARS . . . . (12/1/80)	15.77	31.54	157.70	315.40	5.76	6.31	6.68
2.0 YEARS . . . . (6/1/81)	15.77	31.54	157.70	315.40	5.89	6.31	6.71
2.5 YEARS . . . . (12/1/81)	15.77	31.54	157.70	315.40	5.97	6.31	6.74
3.0 YEARS . . . . (6/1/82)	15.77	31.54	157.70	315.40	6.02	6.31	6.78
3.5 YEARS . . . . (12/1/82)	15.77	31.54	157.70	315.40	6.06	6.31	6.83
4.0 YEARS . . . . (6/1/83)	15.77	31.54	157.70	315.40	6.09	6.31	6.88
4.5 YEARS . . . . (12/1/83)	15.77	31.54	157.70	315.40	6.11	6.31	6.94
5.0 YEARS . . . . (6/1/84)	15.77	31.54	157.70	315.40	6.13	6.31	7.02
5.5 YEARS . . . . (12/1/84)	17.55	35.10	175.50	351.00	6.19	7.02	7.02
6.0 YEARS . . . . (6/1/85)	17.55	35.10	175.50	351.00	6.25	7.02	7.02
6.5 YEARS . . . . (12/1/85)	17.55	35.10	175.50	351.00	6.30	7.02	7.02
7.0 YEARS . . . . (6/1/86)	17.55	35.10	175.50	351.00	6.34	7.02	7.02
7.5 YEARS . . . . (12/1/86)	17.55	35.10	175.50	351.00	6.38	7.02	7.02
8.0 YEARS . . . . (6/1/87)	17.55	35.10	175.50	351.00	6.41	7.02	7.02
8.5 YEARS . . . . (12/1/87)	17.55	35.10	175.50	351.00	6.44	7.02	7.02
9.0 YEARS . . . . (6/1/88)	17.55	35.10	175.50	351.00	6.46	7.02	7.02
9.5 YEARS . . . . (12/1/88)	17.55	35.10	175.50	351.00	6.48	7.02	7.02
10.0 YEARS 2/. . . (6/1/89)	17.55	35.10	175.50	351.00	6.50	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1979. FOR SUBSEQUENT ISSUE MONTHS ADD APPROPRIATE NUMBER OF MONTHS.

2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

TABLE 56-A

BONDS BEARING ISSUE DATES FROM JUNE 1 THROUGH NOV. 1, 1979

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (12/1/89)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (6/1/99)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (12/1/99)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (6/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (6/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (12/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (6/1/ 8)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (12/1/ 8)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (6/1/ 9)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF JUNE 1, 1979, FOR SUBSEQUENT ISSUE MONTHS AUD APPROPRIATE NUMBER OF MONTHS.

2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.

3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.50%.

4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.

5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.50%.

** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

TABLE 57

BONDS BEARING ISSUE DATE DEC. 1, 1979

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER ISSUE DATE	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION				(2) FROM ISSUE TO EACH INTEREST PAYMENT DATE	(3) FOR HALF-YEAR PERIOD PRECEDING INTEREST PAYMENT DATE	(4) FROM EACH INTEREST PAYMENT DATE TO MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/80)	$11.77	$23.54	$117.70	$235.40	4.71	4.71	6.63
1.0 YEARS . . . . (12/1/80)	15.77	31.54	157.70	315.40	5.50	6.31	6.65
1.5 YEARS . . . . (6/1/81)	15.77	31.54	157.70	315.40	5.76	6.31	6.68
2.0 YEARS . . . . (12/1/81)	15.77	31.54	157.70	315.40	5.89	6.31	6.71
2.5 YEARS . . . . (6/1/82)	15.77	31.54	157.70	315.40	5.97	6.31	6.74
3.0 YEARS . . . . (12/1/82)	15.77	31.54	157.70	315.40	6.02	6.31	6.78
3.5 YEARS . . . . (6/1/83)	15.77	31.54	157.70	315.40	6.06	6.31	6.83
4.0 YEARS . . . . (12/1/83)	15.77	31.54	157.70	315.40	6.09	6.31	6.88
4.5 YEARS . . . . (6/1/84)	15.77	31.54	157.70	315.40	6.11	6.31	6.94
5.0 YEARS . . . . (12/1/84)	15.77	31.54	157.70	315.40	6.13	6.31	7.02
5.5 YEARS . . . . (6/1/85)	17.55	35.10	175.50	351.00	6.19	7.02	7.02
6.0 YEARS . . . . (12/1/85)	17.55	35.10	175.50	351.00	6.25	7.02	7.02
6.5 YEARS . . . . (6/1/86)	17.55	35.10	175.50	351.00	6.30	7.02	7.02
7.0 YEARS . . . . (12/1/86)	17.55	35.10	175.50	351.00	6.34	7.02	7.02
7.5 YEARS . . . . (6/1/87)	17.55	35.10	175.50	351.00	6.38	7.02	7.02
8.0 YEARS . . . . (12/1/87)	17.55	35.10	175.50	351.00	6.41	7.02	7.02
8.5 YEARS . . . . (6/1/88)	17.55	35.10	175.50	351.00	6.44	7.02	7.02
9.0 YEARS . . . . (12/1/88)	17.55	35.10	175.50	351.00	6.46	7.02	7.02
9.5 YEARS . . . . (6/1/89)	17.55	35.10	175.50	351.00	6.48	7.02	7.02
10.0 YEARS 2/. . . (12/1/89)	17.55	35.10	175.50	351.00	6.50	7.02	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1979.
2/ MATURITY REACHED AT 10 YEARS AND 0 MONTHS AFTER ISSUE DATE.

TABLE 57-A

BONDS BEARING ISSUE DATE DEC. 1, 1979

ISSUE PRICE . . . . . REDEMPTION AND MATURITY VALUE	$500 500	$1,000 1,000	$5,000 5,000	$10,000 10,000	APPROXIMATE INVESTMENT YIELD (ANNUAL PERCENTAGE RATE)		
PERIOD OF TIME BOND IS HELD AFTER FIRST MATURITY AT 10 YEARS, 0 MONTHS	(1) AMOUNTS OF INTEREST CHECKS FOR EACH DENOMINATION EXTENDED MATURITY PERIOD **				(2) FROM BEGINNING OF CURRENT MATURITY PD. TO EA. INTEREST PMT. DATE	(3) FOR HALF-YEAR PD. PRECEDING INTEREST PAYMENT DATE	(4)* FROM EACH INTEREST PMT. DATE TO FIRST EXTENDED MATURITY
					PERCENT	PERCENT	PERCENT
.5 YEARS . . .1/ (6/1/90)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/90)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/91)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/92)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/93)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/94)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/95)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/96)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/97)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/98)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/99)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 2/. . . (12/1/99)	16.25	32.50	162.50	325.00	3/ 6.50	6.50	----
PERIOD OF TIME BOND IS HELD AFTER EXTENDED MATURITY AT 20 YEARS, 0 MONTHS	SECOND EXTENDED MATURITY PERIOD **						TO 2ND EXTENDED MATURITY
.5 YEARS . . . . (6/1/ 0)	$16.25	$32.50	$162.50	$325.00	6.50	6.50	6.50
1.0 YEARS . . . . (12/1/ 0)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
1.5 YEARS . . . . (6/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.0 YEARS . . . . (12/1/ 1)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
2.5 YEARS . . . . (6/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.0 YEARS . . . . (12/1/ 2)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
3.5 YEARS . . . . (6/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.0 YEARS . . . . (12/1/ 3)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
4.5 YEARS . . . . (6/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.0 YEARS . . . . (12/1/ 4)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
5.5 YEARS . . . . (6/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.0 YEARS . . . . (12/1/ 5)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
6.5 YEARS . . . . (6/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.0 YEARS . . . . (12/1/ 6)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
7.5 YEARS . . . . (6/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.0 YEARS . . . . (12/1/ 7)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
8.5 YEARS . . . . (6/1/ 8)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.0 YEARS . . . . (12/1/ 8)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
9.5 YEARS . . . . (6/1/ 9)	16.25	32.50	162.50	325.00	6.50	6.50	6.50
10.0 YEARS 4/. . . (12/1/ 9)	16.25	32.50	162.50	325.00	5/ 6.50	6.50	----

1/ MONTH, DAY AND YEAR ON WHICH INTEREST CHECK IS PAYABLE ON ISSUES OF DEC. 1, 1979.
2/ EXTENDED MATURITY REACHED AT 20 YEARS AND 0 MONTHS AFTER ISSUE DATE.
3/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO EXTENDED MATURITY IS 6.50%.
4/ SECOND EXTENDED MATURITY REACHED AT 30 YEARS AND 0 MONTHS AFTER ISSUE DATE.
5/ YIELD ON PURCHASE PRICE FROM ISSUE DATE TO SECOND EXTENDED MATURITY IS 6.50%.
** THIS TABLE DOES NOT APPLY IF THE PREVAILING RATE FOR SERIES H BONDS AT THE TIME THE EXTENSION BEGINS IS DIFFERENT FROM 6.50 PERCENT.

APPENDIX

Summary of investment yields to maturity and extended maturity dates under regulations prescribed for Series H savings bonds with issue dates from June 1, 1952.*

Issues	Term to maturity (years and months)		Yield[1] during maturity period							Yield[1] during extended maturity period (10 years)						Yield[1] during second extended maturity period (10 years)		
			1959	1965	1968	1969	1970	1973	1979		1965	1968	1969	1970	1973	1979		1973	1979
6/52- 3/54	9-8	3.00	+.50							3.75e	+.40	+.10b	5.00	+.50e			5.50e	+.50e	+.50e
4/54- 9/54	9-8	3.00	+.50							3.75e	+.40	+.10b	5.00	+.50e			6.00e		+.50e
10/54- 9/55	9-8	3.00	+.50							3.75e	+.40	+.10b	5.00	+.50e	+.50e		6.00e		+.50e
10/55- 3/56	9-8	3.00	+.50							3.75e	+.40	+.10b	5.00	+.50e	+.50e		6.00e		+.50e
4/56-11/56	9-8	3.00	+.50							4.15e		+.10b	5.00	+.50e	+.50e		6.00e		+.50e
12/56- 1/57	9-8	3.00	+.50	+.40						4.15e		+.10b	5.00	+.50e	+.50e		6.00e		+.50e
2/57- 5/58	10-0	3.25	+.50	+.40						4.15e		+.10b	5.00	+.50e	+.50e		6.00e		+.50e
6/58- 5/59	10-0	3.25	+.50	+.40						4.25b			5.00	+.50e	+.50e		6.00e		+.50e
6/59-11/59	10-0	3.75		+.40	+.10b					5.00e				+.50e	+.50e		6.50e		
12/59- 5/60	10-0	3.75		+.40	+.10b					5.00e				+.50e	+.50e	+.50e	6.50e[2]		
6/60-11/60	10-0	3.75		+.40	+.10b					5.50e					+.50e	+.50e	6.50e[2]		
12/60-12/61	10-0	3.75		+.40	+.10b	5.00				5.50e					+.50e	+.50e	6.50e[2]		
1/62-11/63	10-0	3.75		+.40	+.10b	5.00	+.50e			5.50e					+.50e	+.50e	6.50e[2]		
12/63- 5/64	10-0	3.75		+.40	+.10b	5.00	+.50e			6.00e						+.50e	6.50e[2]		
6/64- 5/65	10-0	3.75		+.40	+.10b	5.00	+.50e	+.50e		6.00e						+.50e	6.50e[2]		
6/65-11/65	10-0	3.75		+.40	+.10b	5.00	+.50e	+.50e		6.00e						+.50e	6.50e[2]		
12/65- 5/68	10-0	4.15			+.10b	5.00	+.50b	+.50e		6.00e						+.50e	6.50e[2]		
6/68- 5/69	10-0	4.25b				5.00	+.50b	+.50e		6.00e						+.50e	6.50e[2]		
6/69-11/69	10-0	5.00					+.50b	+.50e		6.50e							6.50e[2]		
12/69- 5/70	10-0	5.00					+.50b	+.50e	+.50e	6.50e[2]							6.50e[2]		
6/70-11/73	10-0	5.50						+.50e	+.50e	6.50e[2]							6.50e[2]		
12/73- 5/79	10-0	6.00							+.50e	6.50e[2]							6.50e[2]		
6/79-12/79	10-0	6.50								6.50e[2]							6.50e[2]		

1/ All yields are in terms of percent per annum, compounded semiannually. The first figure in each maturity period is the overall yield for that period at time of entry into period. Interest payments are on a graduated basis unless otherwise indicated, the full rate being received only if held to the end of the period (lesser rate if redeemed earlier). An "e" indicates payments on an approximately level basis. A "b" indicates increased interest on a bonus basis, that is, the full rate is received only if the bond is held to the end of the period (no increase if redeemed earlier). Rate increases within periods took effect at the beginning of the first full half-year interest period starting on or after the effective date as follows:

1959 - graduated improvements in rate to next maturity beginning June 1, 1959.
1965 - graduated improvement in rate to next maturity beginning Dec. 1, 1965.
1968 - bonus improvement in rate to next maturity beginning June 1, 1968.
1969 - maximum rate to next maturity beginning June 1, 1969.
1970 - level and bonus improvements in rate to next maturity beginning June 1, 1970. In the case of .50b the increase is spread over the second 5 years of maturity period.
1973 - level improvement in rate to next maturity beginning Dec. 1, 1973.
1979 - level improvement in rate to next maturity beginning June 1, 1979.

2/ Yield does not apply if prevailing rate for Series H bonds at time extension begins is different from 6.50 percent.

* The purpose of this table is to summarize the history of yields on Series H savings bonds. Because of the graduated nature of these yields this table does not contain sufficient detail for the calculation of individual checks.

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